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AMERICAN JOURNAL of PHARMACY

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A Record of the Progress of Pharmacy and the Allied Sciences

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EDITORIAL

"UNPREPARED AND UNINSPIRED"

MORE THAN ONCE we have taken to task, in these columns, those whining romanticists who everlastingly deplore the passing of the "good old days." For these people the past has only the pleasant, and the present is brimful of woe.

We have often asked such antiquarians if they would change their comfortable present environment, were that possible, for a time in the past—their "good old days"—when pulse-warmers and anti-macassers were real luxuries.

No, indeed—for if comforts and luxuries be the only criteria of content—the *new* days are the *good* days.

The new days have given us speed in comfort over velvet roads—and sky trips in canvas tubs with no Icarian qualms about our safety.

For us operas diffuse through clouds and perfectly dry lectures are electronned through rainstorms.

We dress ourselves in lustrous garments, chemist-carpentered from pine and poplar—yet silkier and scroopier than ever a silkworm could spin.

Children of the slums today wear clothes giddy with colors which, once upon a time, graced only such as the Queen of Sheba and Tyrian princes.

We turn night into day with the click of a switch—and summer's warmth caresses every wintry day—if the oil burner is in good humor. From Orient and Occident come viands to our board—food, which once was served only to kings and emperors.

In the "new" days the humblest enjoy such gastronomic sprees that once were so exclusive.

And so we might go on—and on—*ad nauseam*. But we are off the trail. What impelled this writing, after all, was a suspicion that there was a kind of a "good" in the good old days that is lacking in the new day and generation.

Elsewhere a sentiment has been expressed that "our single hope is that when a lull in material progress arrives, inventors out of work can find much to do in directing the course of earth to a much-needed spiritual recrudescence.

And there, perhaps, is where the "good old days" were "good."

It was in those days—though not so long ago, that the writer commenced his career in drugdom. He now recalls his first employer—and remembers, with gratitude and affection, the interest he took in the crude, long-legged apprentice who had come to "learn the business" at his establishment.

How diligently he labored to set us straight with the problems of his busy shop!

"Don't dry those tincture bottles mechanically, son—but read every label and try to classify and remember them."

"Oil and water won't mix, boy—but a little gum of araby and a speck of *secundem artem*—and you've got them together to stay."

An old Dispensatory—hardly portable—was one offering he made upon the altar of our early training—and how we consumed its multifarious contents. Every day we pestered him with new questions and every question would bring a cheerful answer.

And then there is the day—that ominous home-leaving day—when with his counsel and material help we started off for college—and started *right* if an inspiring preceptorship counted for anything!

That was in the good old days! But how different are things today. How little interest the average preceptor takes in the youngster entrusted to his care (and perhaps, too, how blasé is the attitude of the average young apprentice—whose high school has trained him in just that way).

Yet the preceptor's responsibilities to his young charges are quite as clear as ever. Drug store experience is rather uniformly a prerequisite to State Board registration, but unless employers acquire a different viewpoint and practice a different technic the whole proposition becomes an idle gesture and a farce.

Young people commencing their institutional training come to their tasks unprepared and uninspired—with their employers largely to blame. It is a great concern, today, with pharmaceutical educators as to how conditions might change for the better.

And so we say that in these respects, at least, the good old days were very good—and the sooner pharmacists come to appreciate their obligations and their opportunities in this direction, the better it will be for the new day of Pharmacy.

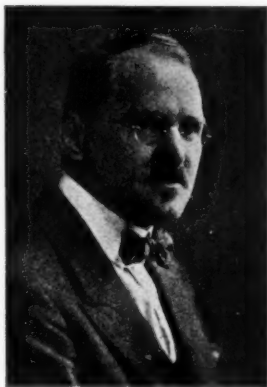
IVOR GRIFFITH.

ORIGINAL ARTICLES

EUROPEAN FLOWERS IN COMMERCE AND CULTURE*

By Professor E. Fullerton Cook

THE MEMORIES of a year in Europe have many ramifications. History, at each turn, forces itself upon one's attention. Mediæval castles with their embattled towers and moats and swinging bridges, become a daily experience but never lose the power to thrill. History lives almost unchanged; one finds one's self in a town of the twelfth century, with the walls still intact, as in Murten, Switzerland, and then within another five miles discovers the ruins of the old Roman capital of Helvetia, Aventicum, two thousand years ago a city of 250,000 people and where still may be seen ruins of the temple of Apollo, the Roman theatre, the Coliseum, rich with mosaics and many forms of architecture and statues of Roman origin. This is Europe, from one angle.



E. Fullerton Cook, Ph. M.

Perhaps one is interested in art and then the great galleries of London, Antwerp, Amsterdam, Brussels, Venice, Florence and innumerable other centres of art treasure satisfy the artistic soul.

If people interest the traveler, they are as varied and as delightful in their native valleys and villages as can be imagined, for there they live and die as for five hundred years before them their progenitors have lived and died perhaps in the same house, carrying on the

*One of a Series of Popular Science Lectures given at the Philadelphia College of Pharmacy and Science, 1927-1928 Season.

same customs and having the same problems, for they have been set in a mold of tradition and have not yet felt the stir of our age.

But for us flowers are the theme. They reflect the desire to create, the love of the beautiful, and the pride of possession, all innate qualities of the human heart. May in Normandy—apple blossom time! Can the imagination picture a scene more beautiful? Fields are intensely green and splendid highways run across France, flanked for miles and miles on both sides by tall trees. Men and women are working in the fields, the oxen are slowly drawing the plough and there in the fields of vivid green, dotted with innumerable scarlet poppies, how spontaneously comes to mind the war poem, "In Flanders' field the poppies grow." It would seem almost as though the blood-soaked earth returned the precious gift of life. From LaHavre to Ancient Rouen and to Paris, and then the first glimpse down the Champs Elysees of the Arc de Triomphe. All decorative gardens seem to be imitations in comparison with those in Paris or in its environs. Here are artistic creations and floral decorations on the Place de la Concorde, and in the gardens at Versailles, which stand supreme. Frederick the Great built his palace at Potsdam, the Sans Souci, to rival Versailles, but the grandeur created by Louis XIV remains unexcelled.

Beneath the Arc de Triomphe burns the perpetual fire by the tomb of the unknown soldier. Here with uncovered heads stand men and women from all corners of the earth, in appreciation of the spiritual significance of that symbolism. Flowers typify the desire to worship at the feet of the heroes of the war which stirs every heart and there may be found the costly wreath, laid at the warrior's feet by king or nation, and by it—equally honoring the dead—may be seen a tiny bunch of field flowers left by some one who has sensed with equal meaning, this expression of devotion.

At the tomb of the unknown soldier in Brussels is found the same instinctive expression of homage and in Westminster Abbey, where the following inscription stirs the heart, again are found the tribute of flowers from rich and poor, the humble and the great.

"Beneath this stone rests the body of a British soldier, unknown by name or rank, brought from France to lie among the most illustrious of the land, and buried here on Armistice Day, 11th of November, 1920, in the presence of His Majesty, King George V, his ministers of state, the chiefs of his forces, and a vast concourse of the nation.

"Thus are commemorated the many multitudes who during the Great War of 1914-1918 gave the most that man can give—life itself—for God, for king and country, for loved ones and empire and for the sacred cause of justice, the freedom of the world. They buried him among the kings because he had done good toward God and toward his house."

From Paris, through Dijou, on to Berne in Switzerland we went through a continuous panorama of the spring, of green fields, blossoming orchards, and the new green of the forests. Nine months in Berne and the Bernice Oberland, continuously impresses the visi-



A Flower Garlanded Swiss Chalet.

tor with the truth that Switzerland is a flower garden. Crossing from France, from Italy, or from Germany, one seems to step from struggle and hardship and the stern realities of life, with little or no esthetic expression shown through the country side, into a land of flowers and color. The difference is instantaneous and is felt whether the picture be a farm house, a small village, an outlying hut, or the modern city; flowers are everywhere.

The rich, prosperous chalets of the country, built so artistically, always have flower-boxes at the windows and vines and flowers the entire length of the galleries which are so characteristically a feature

of the architecture, and then there is the invariable flower garden, probably very formal in its design. Where else can one see the rose bush or the fuschia, trimmed to simulate a small tree three or four feet in height, and with a luxurious, leafy spread at the top bearing masses of magnificent blossoms.

The Swiss house and barn, of course, are under one roof and about them three essential elements are sure to be found: First, the store of firewood, mostly piled into unusual shapes often forming a beehive twelve to fifteen feet high and of equal diameter. Second, another evidence of health and prosperity, said to be the gauge of importance in the community, is the manure pile. This is usually square with the sides made of twisted straw, woven like a basket and usually represents tons of fertilizer. Flowers may be abundant but it is not always the odor of flowers one notices. However, this is accepted as a part of the wealth of the land and as a necessity.

Then the third feature of every home is the fountain of running water. An Alpine source is tapped and the cold stream of crystal clearness usually flows into a stone bowl with the refreshing sound of running water. Here again are the flowers, for one commonly sees potted plants in bloom carefully arranged about the fountain.

If one lives in Berne or any other Swiss city almost every home has a garden and flowers, but, if not, the Tuesday or the Saturday market, to which come the farmers for miles around, affords a riot of color. Many of the farmers can still be seen bringing their garden truck on carts pulled by huge St. Bernards or other powerful dogs, or perhaps an old woman gardener hitching herself to the shaft with the dog.

Here before the stately Parliament buildings, one may buy huge bunches of flowers or potted plants for a few cents and no matter how humble all who market seem to carry away a bunch of flowers. In every home these seem to be as essential as food.

On two sides of Berne, through which the river Aar winds its way, arise hills, one of which may be classed as a small mountain. From the crown of the smaller eminence may be obtained a magnificent view of the snow-capped Alpine range, forty miles distant, that is, when the clouds or mist permit. Here the city had laid out a rose garden of considerable area. As elsewhere in Switzerland these roses have been carefully trimmed to resemble small trees; a long sturdy stalk, and then a mass of foliage, on which bloom the most magnificent flowers. Here has been established a formal garden

and an attractive tea-house and one may spend the afternoon and revel in the view on the one side of the Oberland, and on the other of the quaintly shaped, red-tiled roofs of the city, with the tower of the Munster rising majestically in the distance.

It is typical of the Swiss that a factory should be made beautiful. The building itself would resemble our finest apartment house, with the grounds laid out with flowers and shrubbery. With the high hills north and south of the city, the valley runs east to Thun and to the Bernese Oberland. To the west, up to the edge of the town, rises a splendid forest. One may motor for hours through its vaulted



Formal Gardens. Place du Carrousel. The Louvre, Paris.

canopies, at times with the foliage so dense that the sun cannot penetrate. Here scientific forestry is practiced as elsewhere in Switzerland. The woods are owned by the Canton, or State. These nationally-owned forests are primarily for the benefit of citizens and any resident may have all that he needs for fire wood or for building without cost except that for cutting and hauling. Yet not one tree may be cut without the consent of the professional forester and for each mature tree felled, three new ones must be planted. Many times they are planted so regularly and their trunks are so straight and tall that one may catch through the forest, vistas of columnal

aisles, roofed by arches of green. The floor of the forest is as clean as though it were swept, for the people gather every twig for fire-wood.

A group of University students go with me by third-class train from Berne to Wattenwil. Most of them wear spiked shoes and carry sticks and "rooksacks" in which are carried concentrated soup, bread, cheese, sweet chocolate and an alcohol stove. Extra warm socks and a blanket and sweater are a part of the equipment. The objective of our climb is the crest of the Gantrisch, which is but one of the fore Alps and, although not snow-capped in the summer, is still high enough to pass the timber line and is just the setting for the finest Alpine flowers.

The higher we climbed toward the snow-line the more brilliant is the coloring and the larger are the wild flowers. The buttercup of the green fields at home, with its waxen petals, is justly loved by the children, but the buttercups high up on the Alps, (*Trollius europæus*) called by the Swiss, Ankeballeri, doubled up as they all seem to be, form a ball of gold, often an inch in diameter. It is also a privilege to see for the first time and learn to know the delectable perfume of that tiny garnet-colored flower known as Branderli (*Nigritella nigra*). It is as distinctive and as delightful as arbutus. The flower is only found in the high altitudes and is usually associated with that wonderful bloom, growing in the snow, the Eidelweiss.

Here on the high Alps may be found a large variety of lovely flowers. Perhaps the most outstanding example is the Alpine rose—*Rhododendron ferrugineum*. Its glorious patches of red are to be seen for a long distance up the side of an almost impassable cliff. No wonder the Alpine climber is willing to risk his life and glad to have the thrill of a scramble up or down an almost perpendicular cliff to obtain the reward of the "mountain rose."

Among the outstanding flowers on the mountain-top are the blue Enzian, of medicinal value (*Gentiana asclepiadea*); the Colchicum, the flowers blooming in the midst of melting snow high above the valleys. Then one finds the Primula, Saxifrage, Anemone, Artemisia, Asters, the official *Gentiana lutea*, Soldanella alpina, Myosotis alpestris, Pedicularis rostrata, Ranunculus glacialis, Anthemis alpestris, Satureja alpina, Tussilago, Atragene alpina, and hundreds of others.

The fields of narcissus are one of the famed beauties of Switzerland and in the country around Montreux. Hundreds of tourists come here in the spring of each year to see this wondrous sight.

When you next visit Geneva make the approach if possible by motor over the hills above Lake Geneva and wind your way by circuitous turns through the ancient vineyards above Vevey. It seemed to require an hour just to come down to the shore of the lake and every inch of these gigantic hills is covered by terraced vineyards. To look back is but to see wall upon wall rising to the very crest of



Hydraulic Press Room—Pomade Manufacture—Hot Process.

the hill, and then, on these walls, clinging, without apparent support, are spherical masses of purple flowers, a color most gorgeous. In this strange setting with the background of great walls, they resembled huge amethysts.

Geneva, the international city, has its own charm and the drive along the lake through Lausame, Vevey and by the Castle of Chillon brings one to the cold, stony and, this day, wind-swept and snow-driven valley of the Rhone. We are back in the clutches of winter and when Brigg is reached, at the foot of the Simplon Pass, it is hard to believe that flowers can be blooming anywhere. The pass is

still snow-bound but the longest tunnel in the world carries us into Italy, and to Domadosella, where we saw first the swaggering soldiers of Mussolini and a Red derby hat. Nowhere in the world can one find such picturesque military costumes.

Again we are on the road and in a few hours the glories of an Italian lake, Lake Maggiore bursts suddenly upon us and with it all the evidences of spring—not that of cold Switzerland but of warm and sunny Italy. Flowers of brilliant color, gardens and tropical palms, beautiful villas and tinted palaces, pink or lavender, with



Enfleurage—Pomade Manufacture—Cold Process.

the indescribable, azure-tints of the lake. Then come the days of travel to Milano, and from there, across Italy, to Verona, Venice, Bologna and Florence, each with their peculiar charm. And now, that wonderland of color and flowers, the Riviera. The height of mountains bordering the entire Riviera is a surprise. Every charming town and harbor seems to be isolated by the surrounding hills and it is no unworthy adventure to wind ones way up these mountain roads to the crest and then to drop again to another beauty spot where man and nature have vied in providing charm, and delight, and also entertainment for the thousands who come from every corner of the

globe. Repeatedly on this drive we were rewarded by a view of indescribable loveliness. The blue of the Mediterranean is not exaggerated in picture or story. The rocky coastline, the deeply cut harbors and jutting land add picturesqueness to the picture. From Sestri Levante following the coast, the Cote D'Azur, for one hundred miles through Menton, San Remo, Monte Carlo, to Nice and on to Cannes, both the natural and artificially arranged floral displays are probably unexcelled.

The formal gardens of Menton, Monte Carlo, Nice, San Remo,

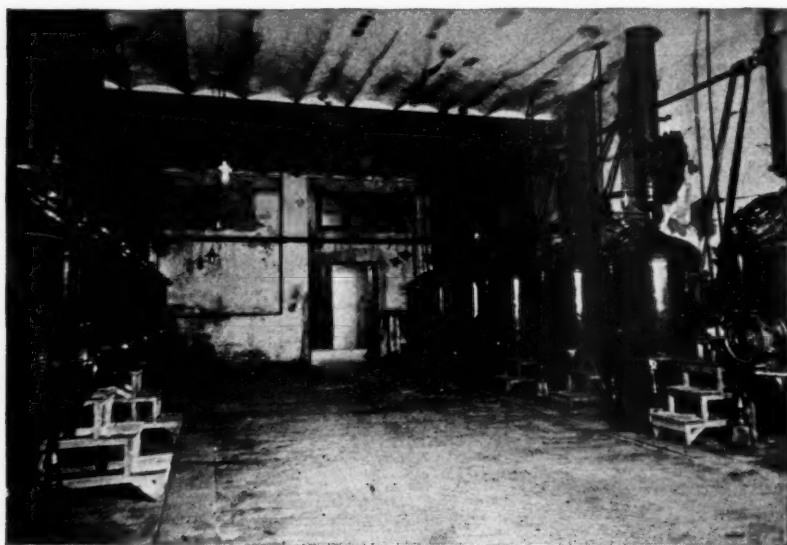


Perfume Extraction with Volatile Solvents.

bordering the Mediterranean coast, thrill the visitor by their gorgeous colors and jewel-like setting in the surrounding hills, but there is a sense of the artificial and as you turn north into the mountains over that unrivalled boulevard, the Grande Corniche, with the blue of the Mediterranean meeting the horizon and the ribbon-like highway to the very peak of the mountain, then dropping precipitously into the valley, over high bridges and mountain streams, here the true beauty of this natural flower-land is seen.

More and more the tourists are being lured over these lovely roads to Grasse, the historic perfume center of the world. A quaint

mediaeval city built on the hills, with arcaded streets often too steep and narrow for modern travel methods—in fact many streets are but a series of steps. Here for a century the flowers have been brought in from the surrounding hills and their elusive perfume seized and concentrated for the joy of those not fortunate enough to live on the Riviera. Here nature has provided all of the conditions; the warm, moist breezes from the Mediterranean, the high hills to shelter the flowers from the north winds, the olive groves upon whose carpeted floor the violets naturally grow. In this land



Distillation of Orris Root.

where flowers have been cultivated for centuries by lovers of flowers there is a continuous but seasonable flow of perfumed harvests into the factories of Grasse.

Violets, jasmine, mignonette, tuba rose, orange blossom, carnation, and lilac each in turn find their way to the perfumer, who skillfully and artistically extracts their essence of delight. When one realizes that it is estimated that 1700 pounds of violets are needed to make one pound of "violet absolute" it is not surprising that the market price today of violet perfume stock is fifteen hundred dollars a pound or that the jasmine blossom yields perfume in such small

amounts that a pound of the essence costs seven hundred dollars, and yet it is this concentrated perfume which alone makes possible modern perfumery and the world comes to Grasse, for its supply. True, the synthetic chemist elsewhere has reproduced marvelous odors, finding their place in the production of perfumes, but the finer natural odors yet defy the skill of the chemist. Synthetic jessamine may be made to resemble the true flower odor, yet there are elusive esters or alcohols in the natural flowers which have not yet been reproduced or even identified.

In travelling through the hills surrounding Grasse everywhere small farms abound where are grown these perfume flowers and the imagination must be given full play to visualize the reality.

But I have said little about medicinal flowers and time will not permit an extensive consideration. Yet these lovely colors and delightful perfumes have a part directly or indirectly in the production of some of the most important of our modern therapeutic agents and many others find a place in domestic uses of no less importance.

First the flower, then the fruit and seed and through this channel come the potent medicinals, morphine, codeine, strychnine, colchicine and strophanthin.

When the linden tree blooms, young and old gather the flowers and carefully dry them for they seem everywhere to be prized for the preparation of a domestic tea. Even in Berne authority is given to the city officials to collect the linden flowers from the trees in the parks and on the street.

Evidently the housewives on the farms in Europe cultivate many medicinal flowers and dry them with the utmost care for the commercial product. The collection of medicinal flowers presented to the writer by Dr. Siegfried of Zofingen, Switzerland, include the following and this but represents a few of the most striking forms selected by myself from his huge stock:

Flos althææ	Flos carthami Pers.
Flos anthos	Flos cyani la.
Flos anthyllidis	Flos farfaræ
Flos bellidis	Flos granati
Flos buglossi	Flos genistæ
Flos cacti grandifloris	Flos hyperici concisus
Flos calcatrippæ	Flos lavandulæ
Flos calendulæ	Flos malvæ arboreæ

Flos malvæ	Flos rosæ pallidæ
Flos meliloti concisus	Flos scabiosæ
Flos pæoniæ	Flos stœchados citrinæ
Flos pedis cati	Flos tiliaë
Flos primulæ veris	Flos violæ electus
Flos rhoeados	Flos violæ tricoloris
Flos rhododendri	

One of the most striking color contrasts of the spring in Europe are the fields of bright yellow, the Sesame in bloom, as a mantle of gold spread upon the verdant hills, and from its seed is pressed an oil of large food value.

Many of the medicinal drugs of the modern vegetable materia medica come from Europe and, while their commercial form is not always the flower, the flower plays an important part in their identification and study and nowhere else has such pains been taken to reproduce their form and color for the education or pleasure of those who cannot see them in their natural surroundings, *Digitalis*, *stramonium*, *veratrum*, *aconite*, *valerian*, *belladonna*, *gentian*, *arnica*, etc., are among these drugs.

Another flower which recently has made for itself an essential place in our civilization is the small composite flower, *pyrethrum*, from which the so-called "Persian Insect Powder" is made and more recently the liquid "fly and mosquito killers," which are adding so greatly to the comfort of our summer days and nights.

And so this excursion into flower lands has led our thoughts among varied scenes and interests always with the inspiration of the beautiful. That there may be no discordant note I leave with you the thought of the return of another spring in Normandy, and the anticipation of our own wonderful land of blooming flowers in the merry month of May.

THE RARE ELEMENTS*

By Freeman P. Stroup, Ph. M.

WE ARE TOLD that the ancients considered that there were four elements—Earth, Air, Fire and Water.

We now know Earth to be a mass of many complex substances and some simple ones; that Air is a mixture primarily of Nitrogen and Oxygen, with traces of Moisture, Carbon Dioxide, Inert gases, etc.; that Fire is a manifestation of certain rapid chemical changes in which volumes of gases are formed and high temperatures produced; and that Water is a relatively simple compound of the elements Hydrogen and Oxygen.



Freeman P. Stroup, Ph. M.

To date nearly 300,000 distinct compounds have been recognized by chemists and classified by them. Doubtless, many more will be discovered as time goes on.

More than 250,000 of these are the so-called "Organic" compounds, and the most of them have been identified within the last half century. Most of the substances with which we have to do are mixtures of two or more of these 300,000 odd compounds.

There are known 92 substances which have resisted thus far all attempts to resolve them into anything of simpler composition, and these constitute the "Elements" of modern chemistry. Numbers of the metals in more or less common use are among these, but it must be said that the commercial form of any one of them is rarely pure (free from other substances). The most prominent of these are Iron, Copper, Zinc, Tin, Aluminum, Lead, Mercury, Nickel, Gold, Silver. The Oxygen and Nitrogen of the air we breathe are two gaseous elements found in nature, and Hydrogen (used in a number of important industrial processes) and Chlorine (used largely in bleaching and water purification operations) are two of the most important artificially-produced gases.

Some of the 90 odd elements are found abundantly on the earth, within the earth or in its atmosphere—a few of them in the free

*One of a Series of Popular Science Talks given at the Philadelphia College of Pharmacy and Science, 1927-1928 Season.

state, but most of them in combination with other elements; others occur but sparingly—at least we have not thus far found them in very large amounts. These latter, nearly 60 all told, may properly be designated “Rare Elements,” and it is of some of these that I wish to talk to you this evening, and particularly of some that have come into rather general use within relatively recent years, and are performing duties that are considered as essential to our comfort and happiness.

About 30 years ago the scientific world was startled by the announcement that the atmosphere contains, in addition to Nitrogen and Oxygen, a number of elements (Helium, Argon, Neon, Krypton and Xenon) which are unlike any previously known elements in that they could not be induced to combine with any of these other elements or with one another—were recluses, as it were, or confirmed celibates in the family of elements. The first one discovered was named Argon because of its inert character. Neon was so named because of its newness, Krypton because of its hidden origin, Xenon because it was a foreigner, while Helium (long known as a constituent of the atmosphere of the sun) did not have its name changed just because it was found to belong also to the earth. The amounts found in the atmosphere (in parts per million) are approximately as follows: Helium, 5 parts; Neon, 12 parts; Krypton, $\frac{1}{20}$ th part; Xenon, $\frac{1}{40}$ th part; Argon, 9350 parts. Excluding Argon from consideration, it is not to be wondered at that these elements escaped detection so long. Their presence in air and their inert characters made them a “seven-day wonder” among scientists, while the average citizen was absolutely unconcerned about them. Probably few persons, if any, imagined that any one of them would ever become of any practical use. Probably all would forever be classed among scientific playthings. But today at least three of them are playing more or less important rôles in the drama of modern chemistry and industry.

Helium has been found occluded in some minerals, but occurs particularly as a constituent of the natural gas found in some of the mid-continent states of this country and in some parts of Canada. From the natural gas it can be separated sufficiently cheaply to permit of its use as the gaseous filler of the gas chambers of balloons and other lighter-than-air craft, to take the place of Hydrogen, Methane and other light gases, all of which are inflammable. It is said to have about 93 per cent. of the lifting power of Hydrogen. Mixtures

of the gases Hydrogen and Helium containing up to as high as 20 per cent. of the former are said to be non-inflammable, but whether or not any of these mixtures are ever used in aircraft the speaker knows not. Someone has estimated that 500 million tons of Helium are going to waste in this country every year, along with the products of combustion of natural gas, yet the country is faced with a shortage for its government-owned aircraft. It has been said that there never was enough "in captivity" to float the Los Angeles and Shenandoah simultaneously, and the country's largest stock was lost when the Shenandoah was wrecked.

Helium's services to humanity are not confined to its lifting powers. It is the filler in certain types of tungsten filament lamps which are used for signalling purposes. The light dims very rapidly. Unusually long sparkgaps are possible in an atmosphere of Helium, and this, together with the pinkish-yellow light produced, makes possible a number of new advertising devices. A mixture of Helium and Oxygen is of great value for deep-sea divers and caisson workers, as it permits of rather rapid "decompression," the process by which such workers are restored to normal air-pressure conditions after having been under abnormal pressure conditions. With the Helium-Oxygen mixture only about $\frac{1}{6}$ th the time is needed that is required when air or a Nitrogen-Oxygen mixture is used.

ARGON

This element is obtained commercially by the fractionation of liquefied air. Perhaps its most important use is as a filler for so-called "gas-filled" electric light bulbs. Argon-filled bulbs need not be very large, even in high-power lamps such as used as a source of light in projection lanterns. Argon is claimed to be the most efficient available gas for gas-filled lamps, mainly because of its low thermal conductivity. Its density is such as to retard vaporization of the tungsten filaments, this making it useful for currents of high intensity. In 1922 there was an average consumption 75,000 cubic feet of Argon per month in this country in the filling of incandescent light bulbs. Doubtless, the consumption is greater now. The "Tungar" (Tungsten, Argon) rectifier is a battery-charging device using a Tungsten filament in an Argon-filled bulb.

NEON

The only other element of this group calling for special mention is Neon. It is also obtained from liquid air. Its chief present use is as a filler for certain types of

incandescent electric light bulbs. The light given off by these bulbs is very penetrating and of a pronounced peculiar shade of red which makes it quite desirable in certain forms of advertising devices. The current consumption is low, and when the light is in operation the whole interior seems to be aglow, no matter how tortuous may be the shape of the glass tube which constitutes the apparatus. Neon-filled lamps are sometimes used in hospitals and other places where a subdued light is desired. In a popular spark-plug tester the peculiar red glow in the tube is due to its being Neon-filled.

RADON (NITON) Belonging to the same group of elements as those heretofore mentioned, but not thus far found as a constituent of air is Radon, also known as Niton and Emanation. It results from the breaking down ("degradation") of radio-active substances, particularly Radium and its compounds. It was not at first thought to be an element hence the name Emanation. It is more soluble in water than the other elements of the group, and is soluble also in alcohol, toluene, amyl alcohol and some other liquids. Aqueous solutions of it are used medicinally both internally and externally, and the gas has been used by inhalation. Its physiological action is similar to that of Radium and it is used in hospitals which cannot afford a supply of Radium or its compounds. Radium and its compounds will be discussed later on in the evening.

RARE METALS Of the present commonly-used metals Aluminum is the lightest, and, doubtless, there are many people who think it is the lightest metal known to man. Not so, however, as there is one (Lithium) that weighs only $\frac{1}{5}$ th as much for a given bulk. It is so light that it floats not only on water but on gasoline. Certain compounds of it have been used in medicine for many years, particularly for rheumatic and gouty conditions. As an aside it might be stated that not a little fakery has been practiced, at least in the past, on the reputed value of Lithium compounds in these complaints. Many a "Lithia Water" has been sold in tremendous quantities, and people have testified to its beneficial qualities, though the only Lithium about it was the word on the label on the bottle and in the advertising matter accompanying it. Lithium compounds impart to a non-luminous flame into which they may be introduced a brilliant crimson color, hence some of them have found considerable use in the manufacture of pyrotechnic mixtures (so-called "fire-

works"). Lately the glass makers have been using Lithium compounds in the manufacture of a special kind of glass.

One of the popular makes of storage-batteries is said to owe much of its efficiency to the presence of Lithium compounds in the liquid. Within a few years a lot of experimenting has been done with alloys of Lithium. Only last year there were built for a local Berlin (Germany) railway two trains of cars of an alloy of Lithium and Aluminum. This alloy is not only lighter than Aluminum but is said to be considerably stronger.

**BERYLLIUM
(GLUCINUM)**

This is another metal that is lighter than Aluminum. For more than a century scientists were baffled in all attempts to isolate it on an industrial scale. It is about a third lighter than Aluminum, but is much harder, scratching glass as readily as does hard steel. It is over four times as elastic as Aluminum and 25 per cent. more elastic than steel. It shows high resistance to the corrosive action of salt water (difference from Aluminum) and other corrosive agents. It has been predicted that airship frames and light-weight machinery may soon be made from this metal and its alloys, and that the metal will soon be as familiar as Aluminum has become within the last two decades. It is not strictly correct to class Beryllium among "rare" elements, as its compounds occur in abundance in nature as minerals, but heretofore were considered as practically valueless. It might better be dubbed a "rarely-used" element. Among the claims made for it are the following:

- (a) When added to Silver it will prevent tarnishing.
- (b) Ten parts of it alloyed with 90 parts of Copper produces a bronze so hard that a file will not scratch it.
- (c) Alloyed with Copper it produces metals of wonderful resonance, particularly adapted to the construction of musical instruments.
- (d) Its oxide as a constituent in small amounts of gas light mantles greatly increases their strength.
- (e) Its oxide, which melts only at 2450° centigrade, is very useful as a constituent of refractories.

TITANIUM

Though one of the ten most abundant elements in the so-called earth's crust or lithosphere, of which it constitutes about 0.73 per cent., Titanium is a rare element in the commercial sense. Ferro-titanium, an alloy of the metal with Iron,

is common enough and finds a large use as a "scavenger" for Oxygen and Nitrogen in steel manufacture. It is the only element that burns vigorously in Nitrogen. Its ferrocyanide in fine powder is a fine green pigment, used largely as a substitute for the arsenical greens once used in wall-paper manufacture. Its precipitated oxide, under the trade name "Titanox," is used as a white pigment, often taking the place of "White Lead." It is claimed to have a third better "covering" power, is not affected by salt water, does not darken as does White Lead, does not bring about saponification of the linseed oil vehicle of the paint of which it is a constituent, and has the important advantage of being non-poisonous. Liquid Titanium Chloride hydrolyzes quickly in moist air, forming a dense white smoke. It has found use in the production of "smoke screens," in "sky-writing," etc.

CHROMIUM

This metal, once a chemical curiosity, is considerably in the "spot-light" these days. Compounds of it have been known and used for a long time, but only within a few years has there been any great use for the element itself. Its most outstanding properties are its hardness and resistance to corrosion. In these days one hears a great deal about chromium-plating, and the probabilities are that within a short time it will largely take the place of plating with nickel and other metals so common for years. Tableware (even silver) is being plated with Chromium to give it a hard surface and to do away with the necessity for frequent polishing. Automobile manufacturers are plating radiator frames, bumpers, etc., with it, as well as parts which are subject to much wear. Jewelry, novelties, watch-cases, electrical appliances, surgical instruments, reflectors, plumbing fixtures, barber-shop equipment, restaurant equipment, and building hardware are only a few of the things that are being Chromium-plated to a considerable extent today. The color is somewhat darker than that of Silver, but is really very beautiful and, as one advertiser puts it, "is bright for life." Chromium electro-plate is heat- and acid-resistant, and so we find among its uses the lining of oil-refinery stills and piping, the lining of dairy equipment, the lining of acid-proof containers, the lining of evaporator and condenser tubes, the plating of the rolls of paper-making machinery, and the plating of the rolls used in making plate-glass. Because of the metal's resistance to wear, abrasion and corrosion, Chromium-plated metals find many other applications, among which

are machine parts, metal screens, molds of all sorts, engravers' plates, wire-drawing dies, files, gauges, printers' electrotypes. Many of these things may be made of soft and easily fabricated metals, and then Chromium-plated, after which they are as serviceable as if wholly made from the highly refractory metal.

TANTALUM

Chemists have been sorely tried in their efforts to find methods for the separation of many elements from the combinations in which they are usually found in the earth, but probably no other element has been more tantalizing to them, nor more tantalizing in its resistance to the action of acids and other chemicals than was the element which somebody appropriately dubbed Tantalum. Though discovered in 1801 it was only recently that an economic method for its production was worked out. Like persons of a retiring disposition, now that a way has been found to coax it out of its natural environment, it has been found to be a really agreeable and useful "member of society" among the elements. It can be worked cold, drawn, hammered, punched, machined, polished, hardened, rolled, etc., but not soldered. It can be brazed to Nickel or Copper. It can be had in pure form as wire, ranging from .001 inch in diameter upward; in sheets ranging from .002 inch in thickness upward, in the form of tubing, gauze, and special shapes. It is used in the fabrication of chemical apparatus, weights, pen nibs, radio-tubes, electric rectifiers and condensers, electric-light bulbs. It has been claimed to be the most resistant metal known—a rather broad statement, perhaps. It resists the action of acids, alkalis, chlorine and other strong chemicals. It has a high fusing-point and, when used as the filament in electric lamps, has a great light-emissive power.

TUNGSTEN

If a vote could be taken to determine which of the rare elements is doing the most to make mankind happy the metal Tungsten would poll a heavy vote. "There is probably no element whose chemistry has shown greater development in so short a space of time as did Tungsten in the first twenty years of the present century." It had been known long before and was used as a constituent of alloy steels as long ago as 1855, and its usefulness in steel was no small item; but when it was found possible to produce a ductile Tungsten the metal made a veritable Lindbergh flight into the view of the common people, as then became possible the first really satisfactory incandescent electric light. Tung-

sten became at once a household word. Besides its use in filament form in incandescent light bulbs, flashlight bulbs, radio-tubes, it is used in pencil form in some forms of arc lights which give off light rich in actinic rays suitable for projection and ultramicroscopic work. Its high melting-point, over 3000° Centigrade, permits it to carry heavy currents necessary for high degrees of illumination. In many forms of electrical apparatus in the operation of which circuits are alternately made and broken Tungsten contact points have replaced the expensive Platinum and Platinum-Iridium points once used. Its high fusing-point contributes greatly to the usefulness of Tungsten wire in the operation of electrical heating apparatus. Tungsten is a valuable constituent of many alloys to which it imparts particularly great hardness and a high resistance to corrosion. It has been claimed for it that some of its alloys are actually harder than the diamond, a substance which for ages was considered the hardest possible substance. It is a constituent of several alloys that have approximately the same coefficient of expansion as glass, and can be used instead of Platinum for sealing into electric light bulbs to carry current into the interior of the bulb. Some alloys of Tungsten have been suggested as useful in the making of jewelry. One containing 75 per cent. Gold and the other 25 per cent. about equally divided between Tungsten and Nickel is easily rolled, hammered or otherwise fabricated, and takes a finer polish than Platinum. Another with Silver resists tarnish and takes a fine polish. As a constituent of steel Tungsten tends to give great hardness, toughness and elasticity, and to hold these even at red heat. Tungsten steel is largely used in the making of tools to be used in the planing, turning and general shaping of articles made from other metals. With these so-called "high-speed tools" it is possible to turn out machine-shop work at a speed 5 to 6 times faster than when tools of ordinary steel are used. Not a little of the prodigious amount of work done in American machine shops during the World War was made possible by the use of Tungsten high-speed tools. The amplifiers which make possible long-distance telephony and those which make possible the hearing of all parts of a program by every member of a large crowd on public occasions, and which are used to direct crowds in railway stations and other places, owe much of their efficiency to the fine Tungsten wire which constitutes the filament in the tubes used in the apparatus. Tungsten touches human life at many points, and we stop to wonder at times how we ever got along without it.

CERIUM

This is a rather rare metal some of whose compounds have been known for a long time and used somewhat in medicine. The metal itself is rather soft and oxidizes readily, so that, when rubbed with a file, it gives off a shower of sparks—is "pyrophoric," to use a technical term. This pyrophoric property is more pronounced in some Cerium alloys, notably in one containing about 70 per cent. of Cerium and 30 per cent. of Iron. A number of pieces of apparatus, gas-lighters, cigar-lighters, etc., commonly used to ignite gas, alcohol, etc., utilize this property of Cerium and its alloys. An oxide of Cerium is present to the extent of about one per cent. in incandescent gas mantles, the other 99 per cent. being wholly or chiefly Thorium Oxide. Neither one alone gives a good light, both together in the proportions named give highly satisfactory results. People who still have to use gas lamps for illuminating purposes owe much to the bit of Cerium Oxide in each mantle.

THORIUM

Mention was made of an oxide of this metal in connection with that of Cerium and the gas mantle. It appears that the brilliancy of the light from mantle lamps is due, at least in part, to rays shot off from the Thorium Oxide present in the mantle—in other words, to radio-activity, a property possessed by this metal and its compounds. Recently a way has been found to produce pure metallic Thorium, and it is now to be had in the form of rods, ribbons, wire, filaments, discs, etc. Perhaps its most important use at the present time is in radio and X-Ray apparatus. "Thoriated" Tungsten filaments in radio-tubes give these tubes many advantages over non-thoriated filament tubes. Some commercial luminous paints owe their luminous properties to their containing small amounts of Thorium compounds.

RADIUM

The existence of this element has been known for only a few years, but so wonderful have been some of the things that have been accomplished through the use of its compounds that nearly everybody can tell us something about Radium. It is interesting to note that to produce 100 milligrams (about one and one-half grains) of Radium Bromide requires (so it has been said, at least) 12 tons of ore, 3 tons of Hydrochloric Acid, 5 tons of Sodium Carbonate, 1 ton of Sulphuric Acid, 1 month's labor (number of men not stated), and 500 successive crystallizations. No

wonder it is expensive. The world's supply of extracted Radium is estimated to be about 5 ounces, and the average increase per year is about 1 ounce. The present uses of Radium and its compounds all are dependent upon the tendency of this element to give off several kinds of so-called "rays," each having important properties. Some of them have pronounced physiological action and a great deal of research work has been done in efforts to find out to what extent these may be beneficial and to what extent they may be harmful. In this connection it should be said that a great deal of fakery has been practiced on the unsuspecting public by unscrupulous charlatans who are ever ready to capitalize to their own profit every new lead opened by scientific discovery. Many preparations which are claimed to contain Radium or to be Radio-active contain no more Radium than does the dust of the street, and are no more radio-active than is a glass of hydrant water. Outside of the use of Radium compounds in medicine there is a rather wide use of them in luminous paints. Yes, there is a trace of a Radium compound in the whitish covering of the hands of self-luminous watches, and on the figures on the face of the watch. Luminous watch dials are said to have from 10 to 20 cents worth of Radium on each, usually intimately mixed with a specially prepared Zinc Sulphide which constitutes the bulk of the pigment. Night-flying air-planes have as high as 9 instruments with luminous dials containing Radium.

MOLYBDENUM This element, a metal, has been put to a number of important uses in recent years. It is used to support the Tungsten filaments in electric-light bulbs; an alloy of 20 per cent. Molybdenum and 80 per cent. Tungsten makes a very satisfactory electric light filament. It often replaces Platinum as the metal for making the "grids" of audion wireless "tubes," and for the "plates" of high-power "tubes." Alloys of it with Chromium and Cobalt are among the so-called "stellite" alloys, which resist tarnish, are not easily scratched and take keen edges, these three properties fitting them for a great variety of purposes, the making of stainless cutlery particularly. Molybdenum steel is characterized by pronounced hardness, toughness, elasticity and tensile strength. Its hardness seems to increase with age, hence it is recommended for the construction of bank vaults, safes, etc.

In our discussion this evening we have had time to consider only a few of the more outstanding of the rare elements that have

come into more or less extended use in recent years. Time does not permit the consideration of the Platinum Group of metals, Gold and Silver (which are "rare" for many of us), and a lot of others which, though rare, have been of use to mankind long enough to be considered at length in encyclopedias and books on popular science. The chemical curiosity of today becomes the useful servant of man tomorrow; perhaps in a few years we may be able to present to you an array of new facts concerning some of our today almost unheard of elements which will be of even more interest to you than those given you this evening.

STUDIES IN THE GENUS MENTHA*

16. THE NON-VOLATILE CONSTITUENTS OF MENTHA AQUATICA, LINNE

By Samuel M. Gordon†

(Continued from July Issue)

Isolation of a Phytosterol

The excess acetic anhydride from the filtrate after the separation of the hydrocarbon was distilled off and the white solid which remained was saponified with an alcoholic solution of potassium hydroxide. The greater part of the alcohol was removed by distillation and the residual solution poured into a large volume of water, whereupon a quantity of flaky, pearly material separated. After filtering, this was crystallized from alcohol. After drying on a porous plate in a desiccator over sulphuric acid it melted at 133.5-134 degrees, the melting point could not be raised by further crystallization. It gave the usual color tests for sterols, including the Liebermann-Burchard and the Whitby reagents.²⁰

0.2389 gm. subs. lost at 110°	0.0072 gm.	
Calc. for $C_{27}H_{46}O \cdot H_2O$		Found
H_2O 4.5		3.0

The substance had probably lost water by previous drying over sulphuric acid.

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²⁰ Whitby, G. S., *Biochem. J.*, 1923, XVII, 5.

The optical rotation was determined with the following result: 0.2317 gm. (anhydrous) made up to 20 cc. with chloroform gave $\alpha_D - 0.35^\circ$ in 1.0 dcm. tube, whence $[\alpha]_D^{20} = -30.2^\circ$.

A portion of the product was converted into an acetyl derivative, which after crystallization from alcohol melted at 122.5 degrees. This and the color reactions establish the substance as a phytosterol, presumably α sitosterol.

The optical properties of the crystals were determined with the following results:²¹

Index of refraction, $n_D \alpha = 1.520 \pm 0.002$

$\alpha = 1.549 \pm 0.002$

$\gamma - \alpha = 0.029$

Transparent and flaky

Good cleavage

Medium high refringence

Parallel extinction

+ Elongation

+ Biaxial figure, angle over 45° .

The indices of refraction are in substantial agreement with those of α sitosterol isolated from the cotton plant by Power and Chestnut.⁸

After the removal of the hydrocarbon and the phytosterol from the unsaponifiable matter by the above-described treatment, the alcohol was distilled off, the last portions being removed by distillation under reduced pressure. The oily unsaponifiable matter now amounted to about 130 gms. and had a deep red color. Attempts to separate the coloring matter or further crystalline material were to no avail. The preparation of a benzoyl derivative, also of an acetyl derivative by the usual methods, yielded only liquid products still retaining the deep red color. The molecular weights of the acetylated product were found to be 395 and 398. Calculated for $C_{27}H_{45}OCOCH_3$ 428, for $C_{20}H_{30}(OCOCH_3)_2$, 388.

As no further crystalline material could be obtained directly or by the above procedures, the whole of this material was subjected to distillation under a pressure of 15 mm., which caused a separation into two parts; a volatile portion of 66 gms. and a residue of 58 gms. Both parts were treated as described below.

²¹ Thanks are herewith expressed to Mr. Joseph Rudolph of the Wisconsin Geological Survey for the determination of the optical properties reported.

The volatile part was distilled under a pressure of 15 mm. with the following results:

Frac.	Temp.	Temp. of metal bath	Gms.	D_{23}^{23}	n_D^{20}	α_D^{20}
1	105-130°	170-200°	7.4	0.8858	1.4790	+ 2.64
2	130-150*	200-215	10.6	0.9130	1.4883	+ 4.03
3	150-180†	215-240	14.0	0.9350	1.4921	+ 6.95
4	180-210‡	240-280	18.0	0.8445	1.4801	+ 2.11
5	210-225	280-300	10.4	0.8753	1.4721	—

*The bulk distilled at 145°.

†The bulk distilled at 165°.

‡The bulk distilled at 195°.

In a freezing mixture the liquids set to a jell, but did not crystallize. All the fractions gave pronounced sterol reactions with the Liebermann-Burchard, Hager-Salkowski and Whitby reagents. Hence portions of each of the fractions were treated with digitonin, but no precipitate was obtained. Portions of each fraction were treated with phenyl and α -naphthyl isocyanate but only the corresponding diaryl ureas were obtained. In view of the contradictory results for sterols, with the color reactions, digitonin and the isocyanates-sterols, at least of the usual type, should be considered absent. The substances present interfere markedly with the usual colorimetric determination for sterols, hence such determinations should be accepted cautiously, unless run in parallel with the digitonin method, at least in plant biochemical studies wherein the composition of the non-saponifiable portion is markedly different from phytosterol.^{22, 23}

Fraction 3 was analyzed.

0.3379 gm. subs. gave 0.9813 gm. CO₂ and 0.3368 gm. H₂O

Calc. for C₁₀H₁₆O

Found

C 78.9

79.2

H 10.5

11.1

The analysis together with the molecular weight from saponification data indicate the formula to be C₂₀H₃₀(OH)₂, a dihydroxide of a diterpene.

²² Nabenhauer, F. B., and Anderson, R. J., *J. Am. Ch. Soc.*, 1926, XLVIII, 2973.

²³ Gardner, A. D., *Biochem. J.*, 1921, XV, 244.

The iodine values of the fractions were determined, but attempts to prepare crystalline bromides, using different solvents and manipulations, yielded only dark oils.

Fraction	Gms. subs.	Mgs. I ₂ required	Iodine value ^{23a}
1 & 2 united	0.2603	360.6	139.0
3	0.3120	400.9	127.9
4	0.2409	320.7	133.1
5	0.3910	346.0	88.5

Residue from distillation of non-saponifiable matter. The residue remaining in the flask after the separation of the oily portion by distillation amounted to 58.0 gms. It solidified when placed on ice. Hence it was dissolved in about 300 cc. of alcohol and allowed to crystallize. The filtered crystals were accompanied by a large amount of oil, which was removed by placing the magma on a porous plate. The solid, after several crystallizations from alcohol, yielded 3.0 gms. of the previously identified phytosterol, melting at 134 degrees.

Isolation of Lupeol

The alcoholic solution, after the separation of the phytosterol, was poured into a large volume of water, whereby an oily, semi-solid mass settled. This was taken up in ether, the ethereal solution dried over anhydrous sodium sulphate and the greater part of the ether distilled, the last portions being allowed to evaporate spontaneously. This treatment gave a small amount of crystals which were still soft. When washed on the filter with a small amount of cold alcohol, a small amount (about 0.1 gm.) of white crystalline material, melting at 180 degrees, was obtained. When crystallized from alcohol, the product melted at 210 degrees and gave the color reactions with chloroform, acetic anhydride and sulphuric acid which are characteristic of lupeol.²⁴

The optical rotation was determined: 0.0802 gm. in 15 cc. Chloroform at 33 degrees gave $\alpha = +0.35$ in a 0.5 dcm. tube, whence $[\alpha]_D^{33} = +12.84$.

The product was converted into an acetate, which melted after

^{23a} Cp. Daubney, C. G., and Smedley, MacLean, I., *Biochem. J.*, 1927, XXI, 869.

²⁴ Likiernik, A., *Ber. Chem. Ges.*, 1891, XXIV, 184.

crystallization from alcohol at 212 degrees. This and the color reactions identify the compound as lupeol.²⁵

The oily material was not further investigated.

The Fatty Acid Portion

After the removal of the unsaponifiable matter, the aqueous solution containing the potassium salts of the fatty acids and the glycerol amounted to about twenty liters. The fatty acids were set free by adding one liter of hydrochloric acid (1:1) while the liquid was vigorously stirred; at the same time a rapid current of carbon dioxide was passed through the solution to prevent oxidation of the unsaturated acids. The fatty acids separated as a black, tarry mass and amounted to 644.0 gms. or 5.0 per cent. of the dried leaves.

The Volatile Acids. The aqueous solution (containing glycerol and the soluble fatty acids) were extracted three times with 330 cc. portions of ether, the ethereal solution dried over anhydrous sodium sulphate and the greater part of the ether removed by distillation, the last traces being expelled by a current of air. The slight residue was steam-distilled, two liters of distillate were collected. Duclaux constants were determined on the original distillate; also after cohobating to one-half the original volume.

Duclaux values on original solution 9.1; 8.5; 7.8
" " " cohobated " 14.8; 11.0; 10.1.

The values indicate a mixture of several volatile acids, which was confirmed by the analysis of the barium salts.

The residual solutions after the determination of the Duclaux values were converted into barium salts and analyzed for barium after drying at 110 degrees.

	Gms. substance	Gms. BaSO ₄	% Ba Found	Calculated for
Original solution	0.3769	0.2497	39.01	(C ₇ H ₁₃ O ₂) ₂ Ba
	0.5804	0.3809	38.63	Ba = 38.88
After 1st cohobation	0.2208	0.1681	44.82	(C ₄ H ₇ O ₂) ₂ Ba
	0.1901	0.1439	44.54	Ba = 44.12
After 2d cohobation	0.1522	0.1030	39.83	(C ₆ H ₁₁ O ₂) ₂ Ba
	0.1087	0.0741	40.12	Ba = 40.48

²⁵ Cohen, N. H., *Rec. trav. chim. Pays. Bas.*, 1909, XXVIII, 371.

The volatile fatty acids present probably combined as glycerides, are thus shown to be butyric, hexylic and heptylic acids.

The fatty acid mass previously mentioned, which weighed 644.0 gms., was next worked up. This mass should contain the higher saturated and unsaturated fatty acids, and also the acids resulting from the degradation of chlorophyll, which according to Willstater and Stoll are phytychlorin c, $C_{32}H_{32}ON_4(COOH)_2$ and phytorhodin g, $C_{32}H_{30}O_2N_4(COOH)_2$. Obviously, the desirable procedure would have been to remove the coloring matter by mild treatment before proceeding further. But a number of experiments in different directions showed this to be a hopeless task. As a rule the coloring matter was soluble in the same solvents as the fats.²⁸ Until such a method is worked out, progress in the chemistry of the green leaf fats will be slow. Even a cursory survey of the literature shows how meagre is our knowledge in this direction, in contradistinction to the knowledge of seed fats.

Separation of the Fatty Acids by the Lead Ether Method

The saturated and unsaturated acids were separated by the method of Varrentrap and Gusserov and yielded 65 gms. of "unsaturated acids" and 143 gms. of "saturated acids," or a total of 35 per cent. of the original "fatty acids" material. No especial difficulty was encountered, but the free acids were still highly colored.

The remaining 65 per cent. remaining in that portion of fatty acids insoluble in ether will be separately described.

In view of the hopeless task of trying to remove the coloring matter which accompanied the acids by mild treatment recourse was had to esterification of the acids with methyl alcohol and sulphuric acid. The methyl esters were distilled, after which the appropriate fractions were combined and examined.

A preliminary distillation of the methyl esters of the "saturated acids" under 10 mm. yielded two parts: up to 250 degrees about 80 gms. and a non-volatile residue. The volatile part was again distilled under 10 mm.

²⁸ Cp. Chibnall, A. C., and Channon, H. J., *Biochem. J.*, 1927, XXI, 479.

Frac.	Temp.	Gms.	Saponification Equivalent
1	-160°	1.7	267
2	160-180	3.3	285
3	180-190	6.7	277
4	190-200	33.0	282
5	200-210	21.2	284**
6	210-225	5.3	300
7	225+	4.5	367

**Yields a liquid acid on saponification.

Most of the fractions were light yellow but darkened considerably in twenty-four hours. On saponification fraction 5 yielded a liquid acid, the others yielded solid acids.

Lead Soaps Soluble in Ether. The lead soaps of the supposedly liquid acids were decomposed in the usual way. The free acids, still dark green, were converted into methyl esters, using sulphuric acid as catalyst, and then distilled under 10 mm.

Frac.	Temp.	Gms.
1	-190	2.6
2	190-200	6.0
3	200-220	15.4
4	220-250	6.0†
5	Residue	—

†Yields a solid acid on saponification.

The residue was a dark pitch-like mass, which evidently had undergone much decomposition. Extraction of the residue with ethyl acetate in a Soxhlet apparatus removed a small amount of a pure white substance melting at 212 degrees.

0.1205 gm. subs. gave 0.3173 gm. CO₂ and 0.1258 gm. H₂O

Calc. for (C₆H₁₂O)_x

C 72.0

H 12.0

Found

71.8

11.7

It was not further considered.

The Unsaturated Fatty Acids

The tables summarizing the distillation of the methyl esters show the unsatisfactory separation brought about by esterification of the mixture of acids. This in part accounts for the decision not to determine the usual "fat constants" before further separation. It was deemed more advisable to proceed directly with the separation by chemical means.

All the liquid acids resulting after saponification were accordingly bulked and separated by bromination and by oxidation.

Isolation of Linolenic, Linolic and Oleic Acids

Bromination of the Liquid Acids. 20 gms. of the liquid acids were brominated according to the procedure of Hehner and Mitchell.²⁷ There were obtained 4.0 gms. of hexabromostearic acid, melting at 180-181 degrees, which when mixed with an authentic specimen produced no depression of the melting point; a small amount of an acid melting at 120 degrees and 12.0 gms. of dibromo-oleic acid.

The bromo-acid melting at 120 degrees was possibly tetrabromostearic acid contaminated by hexabromo stearic. The amount was too small to permit closer study.

The dibromo oleic acid was analyzed for bromine. It contained slightly more bromine than called for by theory, due probably to the admixture of tetrabromo stearic acid.

0.1058 gm. subs. gave 0.0918 gm. AgBr

Calc. for $C_{18}H_{34}O_2Br_2$

Br 36.20

Found

36.91

Oxidation of the Liquid Acids. 20 gms. of the liquid fatty acids were oxidized according to Hazura's method.²⁸ There were obtained 2.0 gms. of dihydroxy stearic acid, melting at 137 degrees (neutral equivalent 318), 4.0 gms. sativic acid, melting at 173 degrees (neutral equivalent 344) and 1.0 gm. of linusic acid melting at 202 degrees (neutral equivalent 385). The results obtained by bromination and oxidation show the unsaturated acids present to be: oleic, linolic and linoleic acids.

²⁷ Rosenthaler, L., *Grundzuge chemischen Pflanzenuntersuchung*, Berlin, 1923, p. 51.

²⁸ Ref. 8, p. 312.

The Solid Acids

After saponification of the methyl esters in the usual manner, the fractions were bulked according to the saponification equivalents of the methyl esters. The material for further examination was divided as follows:

I. Fractions 1 and 2	2.6 gms.
II. Fractions 3, 4 and 6 and fraction 3 of the unsaturated methyl esters	54.4
III. Fraction 7	4.0
IV. Fraction 4 of the unsaturated methyl esters	5.2

Isolation of an Acid $C_{25}H_{50}O_2$

Attempts to remove the coloring matter from III by repeated treatments with alcohol were not successful. 0.45 gm. was obtained by boiling with alcohol and charcoal for twenty hours. Several crystallizations from alcohol and acetic acid yielded an acid melting at 82-83 degrees.

Neutralization Equivalent:

0.0761 gm. required 2.03 cc. 0.1 N KOH

0.1302 gm. required 3.39 cc. 0.1 N KOH

Calc. for $C_{25}H_{50}O_2$

382

Found

377; 384

An acid amide was prepared from 0.2 gm., after crystallization from alcohol it melted at 91 degrees.

The occurrence of a C_{25} acid is accepted cautiously, it is quite likely a mixture of equal parts of a C_{24} and a C_{26} acid, but the small amount of material precluded further study.

Isolation of Mellisic Acid

Fraction IV was boiled with alcohol and charcoal, then recrystallized from glacial acetic acid. After drying in a vacuum desiccator over solid potassium hydroxide, 0.45 gm. of a pure white product, melting at 86.5 degrees was obtained. When mixed with an authentic specimen of mellisic acid from beeswax, no depression of melting point was noted.

Isolation of Myristic Acid

Fraction I was repeatedly crystallized from alcohol, it finally was separated into two parts, one of indefinite melting point, which was not further considered, and a very small portion melting at 53 degrees. No depression of melting point took place when mixed with an authentic specimen.

Neutralization equivalent:

0.0505 gm. subs. required 2.23 cc. 0.1 N KOH

Calculated for $C_{14}H_{28}O_2$

228

Found

225.0

Isolation of Stearic and Palmitic Acids

The main portion of the solid fatty acids amounting to 54.0 gms. was dissolved in one liter of alcohol, and allowed to stand twelve hours, whereupon a small amount of inorganic matter separated. The acids were then precipitated as barium soaps with an aqueous solution of barium acetate. The first precipitate amounted to 16 gms., the second to 2.0 gms. Further addition of barium acetate yielded no precipitate, even on concentration. This may be accounted for by the isolation of a further quantity of oleic acid, about 20 gms.

The acid from the 2.0-gm. portion of barium salt yielded after repeated crystallization from alcohol, 0.5 gm. of an acid which melted at 60.5-61 degrees and gave a neutralization equivalent of 261, thus indicating almost pure palmitic acid.

The main portion of the barium salt yielded the acids as summarized in the following table. Each fraction was crystallized from 95 per cent. alcohol until no further change in melting point and neutralization equivalents was noted. The constants in the table are those obtained after two successive crystallizations with no further change.

Fraction	Gms. Acid	M. P.	Neut. Equiv.
1	0.5	59.5-60	250
2	0.1	58.5-59	254
3	0.2	59	281.6
4	0.1	57-58	284
5	—	57-58	271.4
6	0.2	61-61.5	256

Fractions 1, 2 and 6 coincide closely in melting point and neutralization value with palmitic acid. The intermediate fractions most likely are mixtures of palmitic and stearic acid.²⁹

The Ether Extract

The ether extract was a dark, brittle mass. When ground in a mortar it yielded a light green powder. The solid, weighing 75.0 gms., was treated with 1150 cc. of ether, whereupon all but 25.0 gms. dissolved.

The ether solution was extracted successively with a saturated solution of ammonium carbonate, 10 per cent. solution of sodium carbonate and a 5 per cent. solution of sodium hydroxide. The alkaline liquids were subsequently acidified, but nothing of value could be obtained, hence this portion was not further considered.

Isolation of "Aquaticol" $C_{30}H_{53}O_2.OH$

The insoluble portion from the above ether treatment was dissolved in a large volume of hot alcohol. On cooling a quantity of microcrystalline material separated. This was filtered and the mother liquors reserved for further examination. The separated material still retained the original green color, which was removed by washing several times with warm alcohol; the washings were bulked with the original mother liquors. The crystals were finally purified by alcohol and charcoal. In this way 6.0 gms. of a pure white substance, melting sharply at 273 degrees, were obtained. Further crystallization caused no change in melting point. The compound was insoluble in the ordinary organic solvents, excepting hot alcohol in which it was slightly soluble. It gave the Liebermann-Burchard test, though less marked than phytosterol.

1. 0.1584 gm. lost at 110° 0.0051 gm. H_2O

2. 0.0858 " " " " 0.0027 " "

1. 0.1357 gm. (anhydrous) gave 0.3849 gm. CO_2 and 0.1433 gm. H_2O

2. 0.1763 gm. (anhydrous) gave 0.5020 gm. CO_2 and 0.1859 gm. H_2O

²⁹ Lewkowitsch, J., *Oils, Fats and Waxes*, London, 6th Ed., 1921 Vol. I, p. 118.

Calc. for $C_{30}H_{54}O_3 \cdot H_2O$ H_2O 3.74

Found

1. 3.23

2. 3.23

The compound had evidently lost water by drying over H_2SO_4 .

Calc. for $C_{30}H_{54}O_3$

C 77.9

H 11.7

Found

1. 77.3 11.8

2. 77.6 11.8

The molecular weight was determined according to Rast.

0.0205 gm. subs. in 0.2151 gm. camphor, $\Delta t = 8$

$$\frac{40,000 \times 0.0205}{0.2151 \times 8} = 476$$

Calc. for $C_{30}H_{54}O_3$ 463 Found 476

The compound is evidently saturated. It did not absorb bromine, neither did it absorb hydrogen under pressure in the presence of platinum black. It did not react with semicarbazide, thus showing the absence of a carbonyl group. It was insoluble in aqueous potassa.

While the compound is similar in many respects to *micromerol*, isolated by Power and Salway from *Micromeria chamissonis* L.,³⁰ it apparently differs from it in empirical composition, hence it is proposed to provisionally designate it as *aquaticol*, with reference to the plant from which it is derived and in reference to its alcoholic character. The compound will be reinvestigated when a larger amount of material is at hand.

Though apparently different in elementary composition from *micromerol* ($C_{33}H_{52}O_4$) the melting points of the two compounds were found to be the same, *micromerol* is stated to melt at 277 degrees. When each substance, also a mixture of the two substances, were heated side by side, each specimen melted at 273 degrees.³¹ For further confirmation optical properties were compared. Mr. J. Rudolph, of the Wisconsin Geological Survey, made the following report on the crystallographic properties. Microscopic evidence indicates that the two specimens are identical, as revealed by the following properties.

³⁰ Power, F. B., and Salway, A. H., *J. Am. Ch. Soc.*, 1908, XXX, 251.

³¹ Thanks are due Dr. Thomas A. Henry, Director of the Wellcome Chemical Research Laboratory, London, for the specimen of *micromerol* kindly supplied.

Index of Refraction 1.565 ± 0.002

The crystals are biaxial

Sign is positive

Elongation is parallel to the Y axis

Extinction is parallel

Cleavage is parallel to the optic plane

Optic angle is between 45 degrees and 60 degrees (2 V)

Crystals belong to the orthorhombic system.

While the crystals have different empirical formulas, the agreement in melting points is not surprising in view of the experiments of Myer and Myer,³² who have shown that mixtures of two substances, having melting points close together, and also being crystallographically isomorphous, melt at or not far from the melting point of either substance.

Acetate. 1 gm. of aquatical was boiled for six hours with 20 cc. of acetic acid anhydride. The greater part of the acetic acid anhydride was distilled off and the residue poured into water. After drying on a porous plate the compound was crystallized from a mixture of ligroin and ethyl acetate (alcolysis takes place when alcohol alone is used as a solvent). The acetate melts at 185 degrees; ³³ after cooling and again heated, it did not liquefy at about 305 degrees.

0.1172 gm. (anhydrous) gave 0.3304 gm. CO₂ and 0.1152 gm. H₂O

Calc. for C ₃₀ H ₅₃ O ₂ .OCOCH ₃	Found
C 76.04	76.8
H 11.28	11.0

Isolation of a Compound C₂₆H₄₂O₃

The alcoholic mother liquors, after the separation of "aquatical," was concentrated to a small volume and the concentrate diluted with water. On standing, a light grey substance separated out, which weighed 7.0 gms. This was further separated from dilute alcohol, whereby a separation into two portions took place—one melting at 269 degrees, the other at 245-250 degrees.

The portion melting at 269 degrees was crystallized several

³² Myer, R., and Myer, W., *Ber. Chem. Ges.*, 1919, LII, 1249.

³³ Micromerol acetate melts at 186° (ref. 30).

times from ethyl acetate, from which it separated as microcrystals, melting at 261 degrees with preliminary softening at 210 degrees. The compound gives the Liebermann-Burchard reaction but less marked than phytosterol.

0.0979 gm. (anhydrous) gave 0.2781 gm. CO₂ and 0.0928 gm. H₂O

Calc. for C ₂₆ H ₄₂ O ₃	Found
C 77.6	77.49
H 10.44	10.60
M. W. 402	407

The molecular weight was determined according to Rast.

0.0211 gm. subs. in 0.2289 gm. camphor, $\Delta t = 9.0^\circ$

$$\frac{40,000 \times 0.0211}{0.2289 \times 9.0} = 407$$

An acetate prepared in the usual way melted at 160 degrees with preliminary softening at 110 degrees.

The compound appears not to have been previously described but no name is suggested for it until more is obtained and examined more completely.

Isolation of a Compound C₂₂H₃₈O₃

The more soluble portion melting at 245-250 degrees was recrystallized from ethyl acetate, when it melted at 258 degrees. Mixed melting point determinations with the compound just described gave results far below either, hence the compounds are not identical. This was confirmed by analysis. The compound gives the Liebermann-Burchard test very slowly.

0.0707 (anhydrous) gave 0.1948 gm. CO₂ and 0.0700 gm. H₂O

Calc. for C ₂₂ H ₃₈ O ₃	Found
C 75.4	75.2
H 10.86	11.1
M. W. 350.0	357.0

The molecular weight was determined according to Rast.

0.0148 gm. in 0.1658 gm. camphor, $\Delta t = 10.0$

$$\frac{40,000 \times 0.0148}{0.1658 \times 10} = 357$$

Although presumably new, no name is assigned to this compound, for the reason already set forth.

Chloroform Extract. The chloroform extract was a pitch-black, brittle mass. Nothing of interest could be isolated from it, either by different solvents or by the lead method. It appeared to contain phlobaphenes, since it was soluble in alkalis and precipitated with acids. It did not contain phytosterolins when treated according to Power and Salway's ³⁴ method.

Alcoholic Extract. The alcoholic extract amounted to 15.0 gms. It was a dark solid, which readily reduced Fehling's solution, but no definite substance was isolated. The coloring matter was removed by treating with basic lead acetate in the usual way. From the filtrate, 0.2 gm. of a substance slightly soluble in alcohol and melting at 319 degrees was obtained. It was insoluble in camphor, hence the molecular weight could not be determined by this method. The modification of the Rast method by Carlsohn ³⁵ also yielded unsatisfactory results. It was not further examined.

The compound is stable towards concentrated sulphuric and nitric acids, no evident reaction taking place.

Summary

The material employed for the investigation of the constituents of *Mentha aquatica* L. consisted of the partly dried leaves which had been stripped from the branches.

For the purpose of its examination a quantity (13.8 kg.) of the partly dried and ground material was extracted with alcohol. The extract was distilled with steam, yielding 0.85 per cent. of volatile oil and an aqueous part from which a relatively large amount of acetic acid and a small amount of trimethylamine was obtained. The essential oil gave a strong reaction for furfural and for certain sesquiterpenes.

After the distillation of the alcoholic extract with steam there was obtained a dark-colored aqueous liquid and a quantity of black, oily resin. These products were separately examined with respect to their constituents.

³⁴ Power, F. B., and Salway, A. H., *J. C. S.*, 1913, CIII, 399.

³⁵ Carlsohn, H., *Ber. Chem. Ges.*, 1927, LXB, 473.

From the above-mentioned dark-colored aqueous liquid the following substances were isolated: (1) potassium nitrate in considerable amounts; (2) formic acid; (3) a small amount of a yellow pigment (m. p. 250-253°); (4) glucose (osazone, m. p. 199-201°); (5) succinic acid; (6) rhamnose (osazone, m. p. 178°); (7) betaine $C_5H_{11}O_2N$; (8) choline, $C_5H_{15}O_2N$; and (9) a glucosidic material not fully examined.

The above-mentioned black, oily resin was extracted with various solvents, whereupon the following substances were obtained: (10) methylamine; (11) ammonium chloride; (12) linalool; (13) dotriacontane (m. p. 69.5-70°); (14) a phytosterol (m. p. 133.5-134°); (15) an oil boiling over a large range and yielding pronounced sterol color tests; (16) lupeol (m. p. 210°); (17) a mixture of volatile acids, consisting apparently of butyric, hexylic and heptylic acids; (18) a substance $(C_6H_{12}O)_x$, m. p. 212°; (19) a mixture of unsaturated fatty acids, consisting apparently of linolenic, linolic and oleic acids; (20) an acid $C_{25}H_{50}O_2$ (?) (m. p. 82-83°); (21) mellesic acid (m. p. 86.5°); (22) myristic acid (m. p. 53°); (23) palmitic acid and possibly stearic acid; (24) "aquaticol" (m. p. 273°); (25) a compound $C_{26}H_{42}O_3$ (m. p. 261°); (26) a compound $C_{22}H_{38}O_3$ (m. p. 258°); (27) a compound melting at 319°.

ESSENTIAL OILS AS ANTIFERMENTS

By Ellery H. Harvey

ESSENTIAL OILS enjoy widespread use in pharmacy and food chemistry as medicaments and flavoring agents. In connection with the latter, the convenience, concentration and effect on the finished product has long been recognized. One no longer finds among nationally advertised brands of tomato products, for instance, such as catsup and chili sauce, the dark-colored and dull-appearing preparations common some years ago when the whole or ground spices were cooked with the raw materials in tanks containing iron steam-coils. The absence of tannin in essential oils is one contributing factor in securing bright, snappy-finished products.

In addition, there is a certain preservative action associated with these oils, as one would suspect from the nature of their constituents and from the reputation several enjoy in commercial practice. The

common use of oil of wintergreen and oil of clove in mucilages and pastes is fully as much for preservation as for the purpose of conferring odor. The amount of protection each oil affords when tested under comparable conditions and in concentrations not doing violence to taste and smell was the object of the work reported in this paper.

The technic employed was the same as that used in measuring the anti-ferment value of various chemicals,¹ and of organic dyes,²

TABLE 1. EFFICIENCY OF ESSENTIAL OILS AS ANTIFERMENTS

5 cc. of a 1% aqueous solution of essential oil	% efficiency based on antihydrolizing power of the oil in a yeast-sugar solution at end of 8 hours
Estragon	6.8
Rosemary	6.8
Savin	8.0
Fennel	8.8
Turpentine	10.0
Lemongrass	10.0
Anise	10.8
Lemon	10.8
Pimento	12.8
Orange	12.8
Eucalyptus	13.0
Mace	13.6
Juniper	16.8
Rue	18.0
Caraway	18.5
Sassafras	18.5
Celery seed	20.0
Camphor	20.0
Citronella	20.0
Birch	20.5
Benzaldehyde	22.0
Rose Geranium	24.0
Clove	25.0
Lavender	26.0

¹ Harvey: *A. J. Pharm.* 94, 797-801 (1922); 95, 105-108 (1923).² Harvey: *A. J. Pharm.* 96, 585-589 (1924).

<i>5 cc. of a 1% aqueous solution of essential oil</i>	<i>% Efficiency based on antihydrolizing power of the oil in a yeast-sugar solution at end of 8 hours</i>
Oleoresin Capsicum	26.8
Peppermint	28.0
Cedar	28.4
Bergamot	29.6
Thyme	30.8
Pennyroyal	39.0
Wintergreen	44.0
Cinnamon	48.3

The results obtained, calculated to a percentage efficiency basis, are given in Table 1. Properly interpreted, keeping the numerous variables in mind, the results are valuable in indicating the relative efficiency one may expect when using any of the oils examined. When the low concentration and low solubility of these oils in an aqueous media is kept in mind, the performance is good. Added to this is the big advantage of non-toxicity, in most cases, within the concentration studied.

Since the essential oils are mixtures and their composition varies somewhat with age, environment, etc., exact duplication of results cannot be expected from sample to sample. To test this point, and to determine how well the method was capable of reproducing results under somewhat different conditions, several new samples of oils were secured from a different source and tested. Table 2 indicates what may be expected in this connection.

TABLE 2. REPRODUCIBILITY OF RESULTS

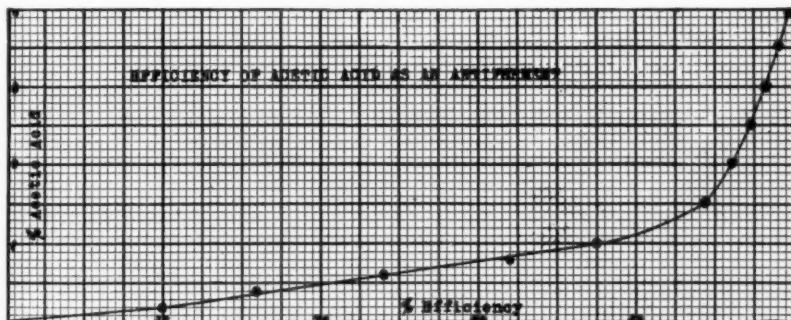
<i>Essential Oil</i>	<i>Percentage Efficiency</i>	
	<i>1st run</i>	<i>2d run</i>
Lemon	10.8	12.0
Sassafras	18.5	20.2
Birch	20.5	22.4
Benzaldehyde	22.0	24.0
Rose Geranium	24.0	24.8

Essential Oil	Percentage Efficiency	
	1st run	2d run
Lavender	26.0	26.8
Peppermint	28.0	28.0
Cedar	28.4	30.0
Bergamot	29.6	30.0
Thyme	30.8	30.0
Pennyroyal	39.0	42.0

Vinegar as an Antiferment

One of the few chemicals in good standing for food preservation is acetic acid in the form of vinegar. The widespread use it enjoys testifies to its efficiency. The antiferment action of vinegar has been included in this study because it is quite frequently used in combination with flavoring oils. The results obtained have been plotted below, indicating for the conditions of the experiment that acetic acid rapidly becomes effective at concentrations of 1.5 per cent. and above.

CURVE I



Effect of Ultraviolet Radiation on the Antiferment Action of Essential Oils

It is common knowledge among pharmacists that many preparations deteriorate on their shelves due to the action of light. The most obvious remedy is to use glass containers which are opaque to the active wave lengths of the spectrum, the short visible rays and

the still shorter invisible ultraviolet having the greatest photochemical effect. The writer has found that the usual clear and blue bottles found in the drugstore are quite transparent, whereas the ordinary brown bottle is decidedly opaque, to the passage of ultraviolet during a continuous eight-hour exposure to a source of ultraviolet radiation ranging from wave length 3450 to the visible.

That the change in color of some oils when stored in glass transparent to the short wave lengths is due to changes induced by the absorption of ultraviolet was shown by an eight-hour exposure of an oil of cinnamon, the latter being held in a corked, clear-fused quartz cell. While preliminary in character, it may be reported that this oil had its antiferment efficiency lowered 5 per cent. by this irradiation. Further work has been done and will be reported later, the whole constituting an extension of experiments begun in 1921¹ when the writer first showed the effect of ultraviolet radiations in connection with the production of alkaloids in medicinal plants, and the toxic action of ultraviolet on yeast.²

Summary

1. The antiferment efficiency of thirty-two typical essential oils has been determined. The popular clove, cinnamon, thyme and wintergreen rank high in effectiveness.
2. The method used is capable of yielding reasonably concordant results if one adheres to stipulated conditions.
3. Acetic acid is an efficient antiferment in concentrations above 1.5 per cent.
4. The absorption of ultraviolet radiations due to the improper storage of oils in glass transparent to short wave lengths not only affects the color but also the antiferment efficiency.

Short Bibliography Covering the Bactericidal Action of Essential Oils

Martindale: Pharm. J. 85, 668 (1911)

Used a slightly modified Lancet method of determining the phenol coefficient of essential oils as a measure of their anti-

¹ Thesis submitted to the Faculty of the Philadelphia College of Pharmacy and Science in partial fulfillment of the requirements for the degree of Ph. M.

² *A. J. Pharm.* 94, 801 (1922).

septic power. This method was criticised, to which Martindale replied in *Perf. Essent. Oil Record* 2, 10 (1911).

Gleinvitz: *Seifensieder Ztg.* 39, 873 (1912)

Points out that the narcotic and disinfectant properties of essential oils and their active constituents do not correspond.

Rippetoe and Wise: *J. Am. Pharm. Assoc.* 1, 1273 (1913)

A study of the preservative action of essential oils.

✓ Seltzer: *J. Am. Leather Chem. Assoc.* 7, 458 (1913)

Reports that the use of 0.05% volatile oil of mustard in tan liquors as an antiseptic is to be preferred to thymol because it does not affect the total solids figure in the analysis of the liquor.

✓ Kloss: *Z. Garungsphysiol.* 4, 185 (1914)

Ten drops of mustard oil in one liter of grape must inhibited all fermentation while 2 cc. of chloroform was insufficient to accomplish the same purpose.

✓ Cochran and Perkins: *J. Ind. Eng. Chem.* 6, 304 (1914)

A study of the comparative value of essential oils as preservatives of cane sugar solutions.

✓ Cochran and Perkins: *J. Ind. Eng. Chem.* 6, 306 (1914)

Report on the comparative values of some essential oils as preservatives of starch syrups by incubation and noting the amount of gas evolved. In concentrations of 0.04% sassafras, cassia and anise were found to be superior to wintergreen and the mint oils.

✓ Morel and Rochaix: *Compt. rend. soc. biol.* 86, 933 (1922); 96, 1311 (1927).

Oils of thyme, juniper, citron and mint were found to have bactericidal action on meningococci, staphylococci, diphtheria bacilli and Eberth's bacillus.

Penfold and Grant: *J. Proc. Roy. Soc. N. S. Wales* 57, 211-5 (1923); 58, 117-23 (1924); 59, 346 (1925); 60, 167 (1926).

The germicidal values of Australian essential oils and their pure constituents.

PROGRESS OF THE RESEARCH CONFERENCE*

By H. V. Army, Ph. D.

IN ADDRESSING the delegates to this, the seventh annual meeting of the National Conference on Pharmaceutical Research, it is proper for me to point out that we should consider the past work of the Conference with a sense of satisfaction and should face the future with a feeling of assurance that such work as ours is destined to continue of great service to American Pharmacy and to the great field of pharmaceutical research.

Those of us who have attended all seven of our annual meetings will recall our initial meeting at Cleveland in 1922 when ten or eleven representatives of seven national organizations sat together in a small room and organized this body and we will then think of our last three meetings (including this one) when delegates of fifteen or sixteen national bodies and their associates, groups numbering sixty or more active research workers, have come together to exchange views and to plan activities for the furtherance of pharmaceutical research.

As to our achievements, the reports of our officers and of our committee chairmen, which will be read during this meeting, will tell the story in detail, so at this time your chairman will merely say that the more important features of our work of the past year were:

(a) Preparation of the 1928 Census of Pharmaceutical Research which lists, this year, 488 persons conducting research in the field of the collection, preparation, standardization and dispensing of medicinal substances.

(b) Co-operation with the U. S. P. and N. F. Revision Committees in promoting investigations tending to improve standards, tests and processes authorized in U. S. P. X and N. F. V.

(c) Encouraging the raising of funds for research work. During 1927 six State pharmaceutical associations dedicated \$400 to research work in the colleges of pharmacy within their respective States. The 1928 record is as yet incomplete but unofficial and official re-

*Address of the chairman, presented at the Portland meeting of the National Conference on Pharmaceutical Research, August 18, 1928.

ports reaching your chairman indicate that it will exceed the figures of 1927. Will it not be a great thing to be able to report within a few years forty-eight young persons doing research in our forty-eight States, under grants furnished by the retail pharmacists of this country acting through their several State associations?

(d) The listing of some 600 persons interested in pharmaceutical research and the keeping of each of these persons posted in the research work of the entire country by means of the bulletins of the research conference.

(e) Utilizing our knowledge of research conditions by co-operating with organizations representing other branches of trade activity in attacking problems common to us all. As an instance of this may be cited the co-operative work on the deterioration of chemicals and pharmaceuticals under the influence of light that is now being carried on jointly by the Glass Container Association and three of our national pharmaceutical groups.

The development of our organization from a group of ten or fifteen in 1922 to a group of over 600 in 1928 is a creditable achievement but this progress has brought responsibilities. We are in the position of a child who has outgrown its juvenile clothing. The administrative methods that were satisfactory for a group of twenty-five or fifty does not suffice for 600 or more; the financial resources of our first five years are entirely inadequate for our present organization. We must either expand or die.

This thought was brought before the Research Conference at its 1927 meeting in the report of your chairman. The delegates of 1927 recognized the seriousness of the situation and directed the appointment of a Committee on Expansion. The report of that committee (which will be presented at a later time this day) and the final action taken thereon will constitute one of the most important milestones in the history of our organization. With no desire to encroach upon the report of the Committee on Expansion your chairman, believing that the future of the Research Conference hangs upon that report, will at least point out its salient features as being essential to the very life of this conference.

There has drifted into the chairman's office during the past year one or two questions as to why this or that has not been done; why, for instance, our committees do not line up more effectively the 500 or

600 associates recorded in the census reports of the last three years; why, again, more aggressive work is not done in bringing about the creation of more research grants. The answer is very simple; so simple that it can be compressed into four statements of fact.

1. The income provided by the terms of our present Constitution and By-laws is merely \$200 per annum.

2. The expenditures of 1926-1927 were \$367.35 and those of 1927-1928 up to August 1st were about \$290.

3. That our Research Conference would be bankrupt were it not for the \$361 in contributions received during 1927-1928, thanks to the activity of the Committee on Expansion and to the generosity of friends.

4. That the cash receipts of 1927-1928, totalling about \$540, would have been inadequate to finance our constantly growing organization had it not been for the fact that routine correspondence was carried on in the chairman's office and that the task of mimeographing, addressing and mailing our bulletins was performed in our secretary's office, both without expense to the Research Conference. The actual expenditures of the conference during the past year have been limited to reprints, to postage, to the mimeographing of committee and delegate circulars and to the preparation of the Census of Research.

It is obvious that an organization of 500 or 600 members cannot be carried on indefinitely by volunteer work; that when it reaches such proportions, the responsible officer must have placed at his disposal proper secretarial help; in short, at this stage, the Research Conference should have an income of at least \$2500 per annum at its disposal.

As to means of raising this sum a number of suggestions have been offered. Among them may be cited:

1. *Contributions from member organizations.* As the list of national organizations who might be interested in the Research Conference is limited, raising \$2500 per annum from this source would mean an undue taxing of the treasuries of our constituent bodies.

2. *Establishing individual membership dues.* At present the 500 or 600 persons on our mailing list are considered as associates. The

generous response from this group to our appeals for donations to cover the financial crisis of 1927-1928 shows that most of our "associates" are willing to support the Research Conference as far as they can, but is it reasonable to expect that these persons actively engaged in research, persons who are devoting both time and money to investigations for the common good shall furnish the ways and means required to keep their national research agency going?

3. *Contributions from manufacturing firms.* No single group obtains more financial benefit from research than our friends, the manufacturers. That they realize this fact is shown by their frequent munificent contributions to the cause of scientific research. Surely there are twenty-five well-to-do firms and individuals who will be glad to contribute \$100 per annum to keep the Research Conference going upon an efficient basis. We are even sanguine enough to expect that some of the more highly favored will devote even larger sums to the cause of pharmaceutical research. In the report of our Committee on Expansion provision is made for two such types of contributing members.

And in conclusion it might be well to answer the question as to how this augmented income will be spent. Anyone who appreciates the enormous possibilities of pharmaceutical research will understand that \$2500 per annum is a small sum to ask for co-operative work in a field of scientific endeavor. This sum will, however, do more than merely carry on the routine secretarial and publicity work of the Research Conference. It will put new vigor into work already conducted by the conference; work that has been outlined above. It will provide opportunities for work in new directions, notably putting the activities of our fifteen standing committees upon a more efficient basis. It will possibly permit cautious excursions into a field where we have been repeatedly urged to tread during the past three years; the publication of special books of research and of bibliographic nature. It will stimulate the establishment of special funds (like the A. Ph. A. Research Fund) providing grants for pharmaceutical research.

The fields are white, all ready to harvest. Will Pharmaceutical America respond to the call for aid in bringing the harvest in?

ABSTRACTED AND REPRINTED ARTICLES

BITES AND STINGS*

WHETHER OR NOT the bite or sting of a certain insect, spider, or other arthropod will result in serious injury, is a question always of interest and often of great importance. The fear of the scorpion and tarantula is almost universal and many are the stories told of fatal effects having followed their stings and bites. The truth of these stories is hard to ascertain.

During the past four years, H. E. Ewing of the United States Bureau of Entomology has been conducting experiments to determine the harmfulness or harmlessness of some of the more common arthropods. The results were published in the *American Journal of Tropical Medicine*, January, 1928, under the title, "Observations on the Habits and the Injury Caused by the Bites or Stings of Some Common North American Arthropods." The subject discussed is of such interest that an unusually complete abstract of the report will be given.

The arthropods studied and reported upon were: (1) The common striped scorpion; (2) the vinegerone, or giant whip-scorpion; (3) the common tarantula of the Southwest; (4) a tarantula of the genus *Pamphobeteus*; (5) the common eastern trapdoor spider; (6) several *Lycosa* (common spiders); (7) the black widow; (8) the house centipede; (9) the giant water bug; (10) a bug of the family Nabidae; and (11) bees. These will be taken up in the order given.

1. The Common Striped Scorpion

This scorpion, *Centruroides vittatus* (Say), is found in the Southern States, as far north as Virginia and Missouri and as far west as western Texas. Its usual habitat is under the bark of logs, under logs lying on the ground, and under piles of brush and dead leaves. It is also found under the flooring of outbuildings and piles of lumber and wood. It frequently invades dwellings.

At 9.12 one morning the writer allowed a specimen to sting him

*Reprinted from the *Naval Medical Bulletin*.

on the back of an index finger. There was an immediate burning sensation. Soon the finger became numb and in fifteen minutes there was slight swelling. At 12.50 the condition of the finger was normal except for a slight numbness.

Later in the day the same scorpion was made to sting another person. Approximately the same degree of injury was inflicted.

The author says: "These two simple experiments indicate that the sting of this common scorpion of the Southern States is but little if at all more serious than a bee sting. . . ."

2. The Vinegerone, or Giant Whip-Scorpion

This scorpion, *Mastigoproctus giganteus* (Lucas) is found in Florida. Other species are found in the Southern States, Mexico, and tropical America. The whip-scorpion lives very largely upon the ground or burrows into it.

It is this scorpion which is so much dreaded by ignorant persons, but morphologists state that it has neither sting nor venom and is harmless. The author allowed a specimen to bite him. There was no pain at any time except when the scorpion was actually biting, and in twenty-five minutes the skin and flesh were normal.

The writer and other people were bitten by this scorpion on other occasions. There was never anything "more than a trivial mechanical effect, similar to that of a slight pin prick."

3. The Common Tarantula of the Southwest

The largest and best known of these is *Eurypelma californica* (Ausserer), which is found in California, New Mexico, Texas, and a few other States. It lives upon the ground in small holes. It is very sluggish unless aroused, when it rears on its hind legs and strikes with its fangs.

A full-grown specimen was kept for several years in the Bureau of Entomology, during which time it was handled by many people. Only once did it bite anyone. A lady was bitten on the tip of the second finger at 4.03 one afternoon. At once a drop of blood collected and blood continued to flow for a few minutes. The pain was considerable and lasted for about one hour. Apparently, it was entirely due to mechanical injury.

4. A Tarantula of the Genus *Pamphobeteus*

Attempt was made by the writer to simulate the bite of this tarantula. He chloroformed one and removed a fang together with its poison sac. The fang was forced into the forearm, but no poison was ejected. Then a drop of poison was squeezed out and placed in the puncture made by the fang and the fang was again forced in until blood came. There was much smarting at the puncture, a wheal developed in a few minutes, and a reddened area appeared after about twenty minutes. After an hour the smarting was very slight and the swelling had disappeared. After four hours there were no effects of any kind.

Of this arthropod Ewing says: "Injury from the bite of this tarantula would probably be not serious. However, if a large amount of venom were injected into a small child much pain and discomfort would probably be produced."

5. The Common Eastern Trap-Door Spider

The name comes from the hinged lid with which these spiders cover the silk-lined holes in the ground in which they live, and from which they emerge only at night. The spider is a common one in the southern part of the United States. The specimen used in this experiment was a female of the species *Pachylomerus audouinii* (Lucas). She was allowed to bite the author at 2.55 P. M. The pain was no more than a pin prick. One hour and five minutes later the condition of the finger was approximately normal, and the next day was entirely so.

This species is dismissed by the author with the following statement: "Although this trap-door spider belongs to the tarantula-like group of spiders and is larger than some of the tarantulas, its venom is of less potency than that of many common web-spinning species. It is a species in no way to be feared."

6. Lycosids (Common Spiders)

A common large spider—*Lycosa carolinensis* (Walckenaer)—was captured by the author in his garden. As he was unable to make it bite him it was chloroformed and its fangs removed. One fang

was thrust into the forearm for its full length. In two minutes there was slight smarting and numbness. Seven minutes later considerable pain was noted and there was slight swelling about the puncture. Twenty minutes after the fang was inserted it was removed and the pain soon began to subside. Within two hours the skin was normal and the pain was very slight.

A very large specimen of *Lycosa punctulata* (Hentz) bit the author on the finger. The wound made was so small it could not be seen with a hand lens. Very slight smarting continued for about half an hour.

A spider of *Lycosa* species buried both fangs in the ring finger of the author. The pain was intense for a short time, but in ten minutes most of it was gone and in half an hour conditions were normal.

7. The Black Widow

Latrodectus mactans (Fabricius) is considered the most poisonous species of spider in America. Baerg, in 1923, allowed himself to be bitten by a mature female. That the results were serious is shown by the observations made by his attending physician, which are quoted by Ewing as follows:

"The toxicity was also manifested by vasomotor changes in the lumbar muscles and muscles of the extremities, and in all the large joints of the body, as was shown by intermittent pains and symptoms similar to intermittent claudication. There also seems to be a disposition on his part to unload very slowly, by elimination, the products of poison. More so than is the case with bites of any of the snakes, including the rattler, that I have observed."

The black widow is found throughout the United States, but is more common in the Southern States. It lives under logs and stones and in cracks and crevices, and in outbuildings and basements. The mature female is about 7 to 9 mm. in length. It is black, except for a red spot, shaped like an hour-glass, on its abdomen. Other spots may be present on the upper surface of the abdomen.

The poison sacs of *Latrodectus mactans* are very large—about 2.75 mm. in length and 1.08 mm. in circumference.

Ewing says:

"The poison or venom of *Latrodectus mactans* is a slightly viscid, transparent fluid, with a slight suggestion of bitterness in its taste when diluted with distilled water. . . . The entire contents of one poison sac of a mature female were dissolved in about 3 cc. of distilled water and taken to a chemist for testing for acidity. Indicators delicate enough to detect a thousandth per cent. deviation from neutrality failed to give any test."

Experiments to determine the toxicity of the venom on man were made.

In the first test the back of the forearm was pricked with a sterile needle until bleeding resulted. A drop of the diluted venom was placed over the wound and rubbed in at 1.36 P. M. At 2.02 note was made that deadening and burning pains were felt at point of wound and had been coming and going about every minute. At 2.15 a sore area around point of injury was noted; there was dull pain in the forearm, and the skin was slightly reddened. At 2.18 there was slight paralysis at the wrist. At 2.36 pain in shoulder. At 2.45 dull pain throughout whole arm was noted. At 4.10 the condition was normal.

In the next test, eight cubic millimeters of the aqueous solution of the venom was injected into the left forearm at 3.52 P. M. Ten minutes later it was noted that there was a slightly whitened swelling about the puncture. It was likened to the swelling which follows a bee sting, but was not so large and there was but little pain. At 4.19 papules appeared about needle puncture. Burning sensation came on. At 4.56 the author made this note:

"The lower part of the arm is somewhat numbed, and there is a dull deadening pain in most of it. Wheal is small. Surface of skin about needle puncture moist with sweat. The small papules about the central wheal give the skin the appearance of goose flesh and suggest a condition found following poisoning from poison ivy, yet the entire local effect produced by injecting the *Latrodectus* venom is quite different from the effect produced from ivy poisoning. After the spider venom had had time to act I found it rather hard to use the fingers of the hand freely. They were not paralyzed but were numbed and responded somewhat in a manner similar to that observed when the hand has been exposed to severe cold weather. The effect was a numbing rather than that of paralysis."

By 9.54 the pain was slight. The author slept well during the night although there was some pain in the forearm until he went to sleep. In the morning there was no pain, but the moist area was still present and there was some itching. The next evening some pain returned. On the second day there was some itching, and the moist area persisted for several days.

Ewing compares the results of his experiments with the results of Baerg's bite by the *Latrodectus* in this manner:

" . . . In the hypodermic injection much less than 1 per cent. of the amount of venom necessary to fill completely one of the poison sacs was used, yet many of the symptoms produced were almost identical with those that follow the bite of the spider. The effect on the nervous system and the pain produced were much less than reported by Baerg. But in both instances the injection of the venom was slowly followed by the formation of a whitish wheal about the puncture point; in both cases there were recurrent shooting pains; and most characteristic of all, in both experiments a persistent moist area formed about the injury point and lasted a long time. In the case of the writer's experiment the area was sticky. It was apparently formed by a sweating process which left a sticky residue. Long after all other symptoms were gone this moist, stick area remained."

A third experiment was undertaken, in which a fang of an adult male spider was thrust into the skin and the poison sac squeezed. The results were slight, although there was a transient, intense pain. The writer concludes from this that the male was almost devoid of poison.

8. The House Centipede

Scutigera forceps (Raf.) is found throughout temperate North America. It is considered harmless by entomologists, but is dreaded by many persons. Its habits are well known.

A full-grown specimen was induced to bite the writer on the hand. There was a slight burning, which continued for a few minutes, and a small wheal developed in eight minutes. The next morning the only indication of a bite was a minute red speck.

Ewing says that the fears of this centipede are groundless. Its jaws are so weak that it can hardly penetrate the skin with its fangs. Where serious results have followed its bites, they are probably due to infection.

9. The Giant Water Bug

Of the bites of this bug the writer says:

"When *Benacus griseus* bites it emits a milky fluid from the tip of the beak. And the beak adheres to the skin after penetration, so that the skin is pulled up when the beak is withdrawn. Judging from these observations the bite of *Benacus griseus* is rather painful, and the effects are more than transitory, yet they are hardly to be considered serious."

10. A Bug of the Family Nabidae

A bug of this family bit the author when he was working in his garden. The sensation was similar to a mosquito bite, but when feeding was interrupted the area around the bite looked like that which follows a bee sting. The smarting soon stopped and the swelling disappeared, only to return two days later, after which it slowly subsided. So far as the author knows this is the first report of a man being bitten by this bug, *Nabis rosipennis* (Reut.).

11. Bees

Bee stings are too common to require much comment. It is of interest, however, to learn from an authoritative source that yellow jackets—*Vespula germanica* (Fabricius)—sometimes do and sometimes do not leave their stinger in the puncture made in stinging, and that it is questionable whether or not tolerance may be acquired to bee stings.

Thus it is seen that many of our most dreaded arthropods are in reality comparatively harmless creatures, and that, except in the case of *Latrodectus*, no fears of serious consequences need be felt following their sting or bite. The treatment, therefore, need consist only of measures to relieve pain and prevent infection.

The black widow—*Latrodectus mactans*—is probably the only really poisonous spider found in North America, and its bite may result seriously.

MEDICAL AND PHARMACEUTICAL NOTES

BANISTERINE, A NEW NARCOTIC AND MEDICAMENT.—*L. Lewin*. (*Chem. Ztg.*, 1928, 52, 357.)—E. Merck has prepared a new alkaloid, banisterine, $C_{13}H_{12}ON_2$ (m.pt. $256-257^{\circ}$ C.), from the plant banisteria, a liana of the order *Malpighiaceae*, found widely in South America, and used by the natives for the preparation of a drink. It is slightly soluble in ether, and crystallizes from alcohol or ether in shining prisms. The hydrochloride (m.pt. 264° C.) produces symptoms of excitement, accompanied by hastened respiration, dilation of the pupils and sometimes madness, when 0.005 grm. is injected into a dog. The alkaloid is identical chemically, but not toxicologically, with harmine.—(Through *The Analyst*.)

COLOR TEST FOR VITAMIN A.—The color test for vitamin A in cod liver oil has now been proved thoroughly reliable when compared with the old, biological method of testing for presence of this vitamin, according to experiments carried on at laboratories in the University of Sheffield, University College, London, Kings' College for Women, London, the Lister Institute and the University of Oslo.

At these laboratories several different samples of the oil were tested by the biological method, which is a feeding method carried out on experimental animals, and the same oils were tested by the color test by Dr. Otto Rosenheim, of the National Institute for Medical Research, who originally devised the color test. The results were so similar that the reliability of the color test was proved without any doubt.

However, the two methods are now to be compared for other substances containing vitamin A, such as butter.

COD LIVER OIL INCREASES RED BLOOD CELLS.—Cod liver oil, of course, prevents rickets, but it is also immensely helpful in treating anemia, not the pernicious type, but the mild type, sometimes known as nutritional anemia, which occurs when the number of red cells in the blood is a little under normal and the patient is also a little under par. Some physicians have for a long time been prescribing cod liver

oil to children and adults who were pale and listless, had no appetite and tired easily, who were in reality, suffering from a low grade anemia. Experiments carried on at the Kansas State Agricultural College here have shown that the oil helped these patients by increasing the number of red cells in their blood.

The experiments were made on college girls who took a teaspoonful of the oil daily. The gain in red cells after eleven weeks is reported at from 800,000 to 1,500,000. The normal number is 4,500,000 to 5,000,000 red cells per 100 cubic millimeters of blood. The girls all showed a corresponding improvement in physical condition.

SALT WATER BATHS IN SEASICKNESS.—When the ship begins to pitch and roll and you feel waves of seasickness overwhelming you, try a salt water bath. The water should be from 90 to 95 degrees Fahrenheit, its specific gravity 1.020.

Lie in the bath with your eyes blindfolded, your body supported lightly at shoulders, buttocks and back of head, with the toes just touching the end of the tub to keep the legs from floating. Stay in the bath for a half hour, an hour, or longer if necessary. This procedure gives great and usually permanent relief within a short time.

This method of treatment was worked out by Dr. R. A. Bennett, who used it in extreme cases where exhaustion from seasickness was becoming dangerous. The bath moves as the ship does, but water has not time to respond to the motion, so it and the patient immersed in it remain fairly motionless. It is this relative immobility and not the sedative effect of the bath that is responsible for the relief it gives. —(*Science Service.*)

THE ORIGIN OF SODA WATER.—It is the custom to call upon the school children of the country to contribute to memorials and monuments and movements of any sort which somebody else wants to have helped along.

Now if I should ever start a school subscription it would be for something really popular among the pupils. It would be for a monument to the inventor of soda water, and it would not be a dusty bronze statue over a dry marble basin, but a fountain in every schoolroom flowing freely the beverage that carbonates but does not inebriate.

The inventor was the Rev. Joseph Priestley, the discoverer of the chief element in the world, oxygen, and a chemist in whom we take a peculiar interest, for when England got too hot to hold him he

sought refuge in Pennsylvania, where his home in Northumberland is a shrine to which American chemists pay pilgrimages. He was triply distrusted and ill-treated in his native land on the grounds that he was a republican, a non-conformist and a chemist, so a mob burned up his home and laboratory in Birmingham.

While he was preaching in a chapel in Leeds he lived near a brewery and so became interested in the possibility of utilizing the gas which came off the vats. When he moved away from this favorable location he had to devise some means of preparing and collecting the incombustible gas, then called "fixed air." This led him to the invention of the pneumatic trough, which is still the main mechanism of the analysis and storage of gases. He also determined the solubility of carbon dioxide and employed it for charging beverages. Perhaps you would like to hear the full title of this epoch-making paper of 1772. "Directions for impregnating Water with Fixed Air in order to communicate to it the peculiar spirit and virtues of Pyrmont Water, and other mineral waters of a similar nature."

Priestley's experiments interested a Philadelphia physician, Dr. Philip Syng Physick, and he induced a druggist, Townsend Speakman, to prepare carbonated water for his patients. Speakman added fruit juice as a flavor and then and there the soda water business was born, 1807.

Previous to Priestley only natural carbonated beverages were known but their use goes back to the remotest times, both in beverages charged with carbon dioxide by the fermentation of fruits and grains and in spring waters charged in the internal reservoirs of the earth. Mineral springs have been sought by the sick and suffering in all lands and ages. Wherever in Europe you find springs of carbonated water there you are likely to find the ruins of some Roman city, which probably remains to this day a fashionable resort whether it be called Bath, bad or bain.

The effervescence of the waters seemed to cause effervescence of the human spirit for the spa has always been famous for its atmosphere of gayety and these pleasure cities are commonly called "watering places," but could better be called "carbonating places" for water could be had at home but people had to go long distances at great expense in time and money to "take the waters" at the bubbling spring. But now we can get such carbonated beverages at any drug store or grocery store and often in between.—(*Science Service.*)

NEWS ITEMS AND PERSONAL NOTES

HENRY S. WELLCOME A DOCTOR OF LAWS.—The honorary degree of Doctor of Laws was conferred on Mr. Henry S. Wellcome by the University of Edinburgh on June 28. The degree was conferred in recognition of Mr. Wellcome's great services to science and medicine, his interest in missionary enterprise, and his personal work in medical research, the history of medicine, archæology and geographical exploration. In presenting Mr. Wellcome for the degree the Dean referred especially to Mr. Wellcome's vision and discrimination shown in his efforts in these fields. Particular reference was made to the Wellcome Bureau of Scientific Research, the Wellcome Historical Medical Museum and other institutions founded by him, including Tropical Research in the Sudan, the West Indies, China and Uganda. The patriotic services Mr. Wellcome rendered on the medical side in the South African and European wars were also mentioned. So large-hearted a benefactor was indeed, added the Dean, a welcome guest worthy of the highest honour the University could bestow.—(*Pharm. Jour.*)

IN CONVENTION ASSEMBLED.—Members of the faculty of the Philadelphia College of Pharmacy and Science have reason to be proud of their record in the matter of attending conventions. At the New Jersey meeting, the Pennsylvania gathering, the Delaware Society, the Association of Colleges, the Research Conference, the Science Seminar, the American Pharmaceutical Association—at all of them the faculty has been well represented. Dr. Wilmer Krusen, president of the Institution, and Deans LaWall and Sturmer have all been seen at one or another of these meetings. Many other members of the faculty, too, are present and active in the work of the various associations. It is a fine tribute to the initiative and enterprise of the Institution.

BOOK REVIEWS

A TEXTBOOK OF ORGANIC CHEMISTRY.—By Joseph Scudder Chamberlain, Ph. D., Professor of Organic Chemistry, Massachusetts Agricultural College. Second Edition Revised. P. Blakiston's Sons and Company, Philadelphia. \$4.00.

A careful comparison of the subject matter of this edition with that of the first edition (which appeared about seven years ago) shows much evidence of revision, both of the general and the tabular matter. The considerable number of errors (mostly typographical) found by the present reviewer in the first edition have nearly all been corrected. One that persists is the application of the name "collodion" to certain cellulose nitrates instead of to their solution in a mixture of ether and alcohol. Another is the use of 3.0 grams instead of 5.0 grams in determining the Reichert-Meissl Value of fats.

The table of contents has been condensed from 34 $\frac{1}{4}$ pages to 19 $\frac{1}{2}$, without, however, lessening its usefulness, the table in the first edition having been unnecessarily detailed.

There has been some condensing in the body of the book, chiefly by deleting some of the series of elaborate structural formulas with which certain processes were illustrated. The reviewer is not sure in his own mind that this was a wise thing to do, at least in some instances.

Electronic formulas are explained on page 13, but throughout the rest of the book the simpler structural formulas are used.

A very valuable feature of the volume, particularly to the student who wishes the details of any manufacturing process, is the extensive list of references to original sources (several thousand in number) given in the Appendix. There are 432 reference numbers used in the body of the book, but when one turns to the list in the Appendix he often finds a half-dozen or more references listed under one number. Page references are usually given, and 25 different laboratory guides are referred to.

Another valuable feature, particularly to the student who uses the book as a textbook, are the lists of so-called "Questions" given at the ends of the several chapters. They "touch the high spots," as it were, and enable him to review effectively, with a minimum expenditure of time, the principal facts concerning any particular group or groups of compounds.

Mechanically this volume is an improvement over the first edition, in that, while the matter on a page occupies the same amount of space, the pages are larger. The increase in size of the margins adds materially to the appearance of the book.

We unhesitatingly recommend this edition to students in schools, as well as to others who wish a good general survey of the fundamentals of organic chemistry.

F. P. STROUP.

Key-Catalogue of Insects of Importance in Public Health; prepared by Prof. C. W. Stiles of the U. S. Public Health Service and Dr. Hassall of the U. S. Bureau of Animal Industry. The different genera of insects are cross-reference to the following subjects:

A, biting insects; B, on cadavers or in graves; C, control of public health pests; D, dermatology (lesions, dermatitis, eruptions, exanthema, parasites, urticaria); E, edible (food, drink); F, excreta; G, food and drink; H, jurisprudence; I, laity (fear, superstition); J, parasites and pseudoparasites (abdomen, ear, external, eye, head, intestine, miscellaneous, mouth, nose, stomach, subcutaneous, throat, urinary system); K, pests (books, clothes, drugs, records, miscellaneous); L, pinching insects; M, poisons (arrows, defensive, food, spines, miscellaneous); N, pollution (air, water); O, stinging insects; P, therapeutics (lay, professional); Q, vectors (*Aspergillus*, bacteria, filth, Protozoa, Trematoda, Cestoda, Nematoda, Acanthocephala, Insecta).

The cross references make it possible to look up the diseases transmitted by insects, or by referring to diseases the names of insects can be found.

The price of the Bulletin is twenty cents and may be obtained from the Government Printing Office, Washington, D. C.